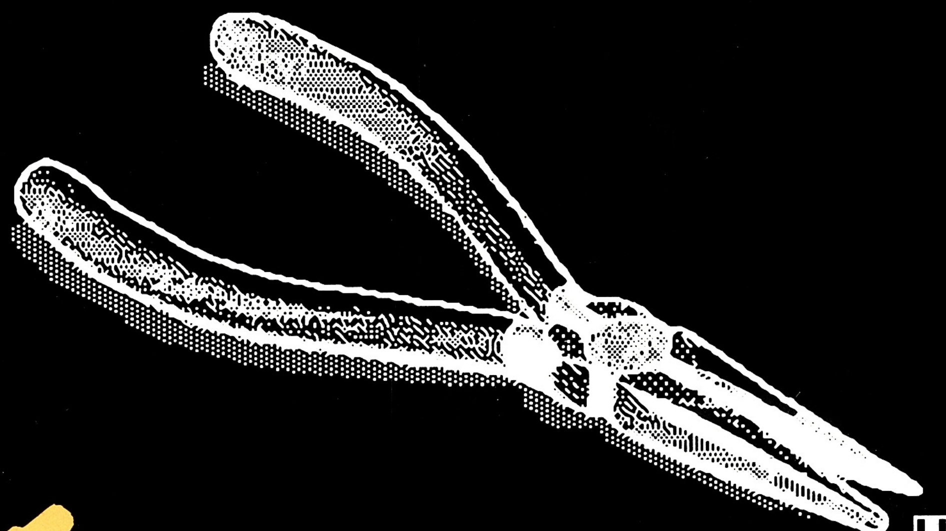
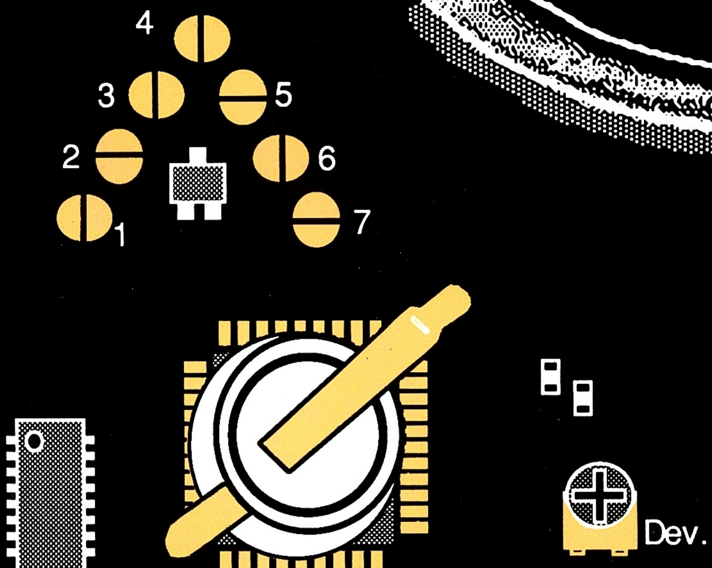
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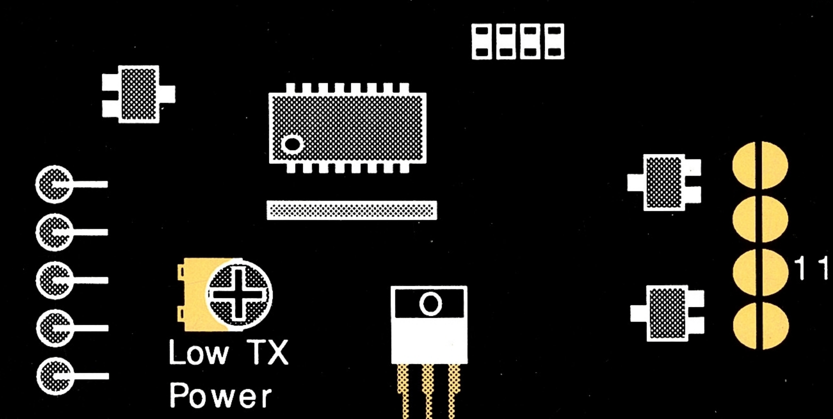
Radio / Tech Modifications

& Alignment Controls





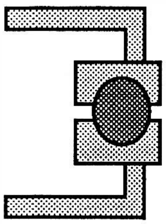
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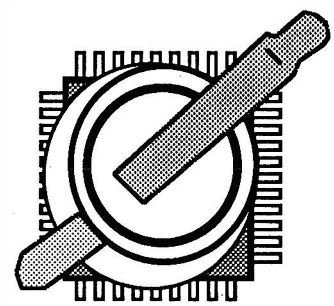
ICOM
Kenwood
Scanners

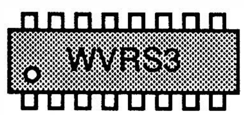
Radio / Tech Modifications

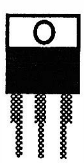
& Alignment Controls

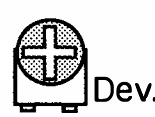


Volume 5A









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Radio / Tech Modifications

NUMBER 5A 10 9 8 7 6 5 4 3 2 1

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Content

Preface

THERE ARE 2 BOOKS IN THIS VOLUME. AN ORDER FORM FOR THE OTHER HALF IS AVAILABLE IN THE BACK OF THIS BOOK.

We call them Volume 5A and 5B. Volume 5A contains all modifications for ICOM and Kenwood Radios and mods for the popular scanners. Volume 5B has all the modifications for Yeasu, Alinco, Standard, and popular CB radios.

During the past 3 years we have created 5 volumes of Radio/Tech modifications. Each new volume included the information contained in the previous volumes. So if you have the current volume, you do not need to purchase the previous ones.

The illustrations have been improved and the modifications have been performed by many people through out the world. The modifications contained in this book are accurate and current.

We make every effort to provide all available modifications for every radio we can find. We also try to keep the cost of the modification books as low as possible. We ask that you do not photocopy pages from these books. We will support you however we can, however, if you call us we will ask that you have the book in your hands at the time of the call.

It was only logical that we start to include the alignment points for each of the radios. Since you are inside them performing the modification, it is a good time to adjust the Modulation and Power levels. If you are not familiar with testing the levels, a section on service tools is provided to give you three methods of testing your radios.

If you find a new radio is not listed in these pages, contact us and ask about it. We may have a copy that did not make the printing deadline. If you purchased the book and have proof of purchase, we can make the new modification available to you.

Your comment and suggestions are always welcome. If the mod works great, let us know. If you can't make the mod work, let us know. We can't test every modification, we don't have all the radios. Your help will make the next volumes better for everyone.

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> **Edgemont PA 19028**
> **Born: Dec 25 1933**
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> **County: Delaware**

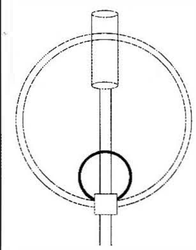
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Shipping charges depend on destination.

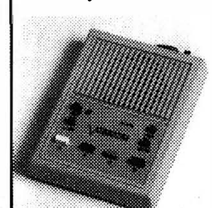


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Computer Interface Cables

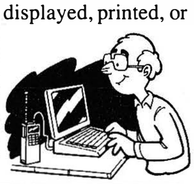
j•Com computer interface cables connect the Comm port of your PC directly to the computer control interface on your transceiver. All of the electronics for the interface is hidden in the shielded DB-25 connector for maximum compactness and **minimum RF susceptibility** and radiation. Power is "stolen" from the PC, so **no external power supply** is necessary. Compatible with CT, HamWindows, DXBase, LOGic, and all other rig control software. Completely assembled and ready to plug in. Available for **Kenwood, Icom, Yaesu and TenTec** radios. Please specify the transceiver model number when ordering.

Computer Interface $54.95 ($5 s/h)

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The j•Com SofTNC is a software program which works with the Baypac packet modem to provide a very easy to use packet terminal. Simple commands allow you to easily connect to and monitor your local PBBS or DX cluster. Text is automatically captured in a scrollable buffer which can be displayed, printed, or saved to disk.



BayPac modem	**$49.95**
SofTNC	**$19.95**
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'AT' 9 pin adapter	**$5.95**
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Disguised Decal Antennas

146 / 220 / 440 / Cellular • 50 Watt • 110 Watt

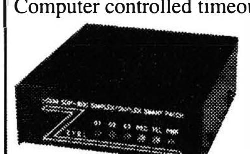
This .003 inch thick , **3.5" x 3.5"** antenna just sticks to the inside of your windshield, where it's safe from vandals, carwashes and low garage doors. The **multi-polarized** design reduces QSB in urban and rural areas. Wide bandwidth for **low SWR** on all frequencies. Etched polymide with anti-corrosive graphite colored coating. "Alarm" decal optional. Other frequencies available. ***Please specify band, power and "plain" or "alarm".***



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Introduction

WHO SHOULD PERFORM MODIFICATIONS

This book is intended to be used as a reference guide for licensed Technicians. The text for each modification has been written with belief that the performing technician has experience with servicing modern radio equipment.

Attempts to perform these modifications by an inexperienced person may cause serious damage to the radio. Damage can occur by simply opening the radio case incorrectly. With the average repair cost of a damaged radio exceeding $150.00, it is a good investment paying a licensed technician to perform the modification.

Many of the new radio are constructed with components that are barely larger than the head of a pin. Many of these parts require precision soldering. Excessive heat can damage these parts. Caution and the proper tools should be used to avoid damage to the components.

Some of the modifications presented in this book have not been tested. However, most of the modifications have been, at one time or another, reviewed by the technicians at the radio manufacturing or distributing plants.

USE THE PROPER EQUIPMENT

Alignment controls have been shown on many of the radios presented here. Proper alignment of a radio require test equipment that is usually not available to the average operator. Exercise caution when changing the alignment controls. Improper settings can cause a radio to generate RF signals outside the desired frequency range. These undesired emissions will cause interference to others and may quite possibly be illegal.

Service manuals are valuable to any radio service technician. Service manuals will provide you with a list of components and detailed drawings of your radio. Our technical department is always looking to review the service manuals for the radios presented in this publication. If you have a service manual for a radio present here, we would like to review it.

MODIFICATIONS OF TYPE ACCEPTED EQUIPMENT

Some of the modifications presented in this publication may allow a radio to operate outside its design range. Using a radio outside of its designed range may cause radio interference, equipment damage or may simply be illegal. If you have any concerns about the validity of the modification, or the purpose for a modified radio, do not perform the modification. Use your best judgment.

HOW FAR 'OUT OF BAND' WILL MY RADIO OPERATE?

The exact Receive and Transmit Frequency range of a radio is almost impossible to predict. The technicians at the factory tune a radio to operate in the specified range. Most radios can be tuned to operate almost anywhere within a 50 MHz range.

Once a radio is tuned, it should operate anywhere within a 30 MHz window. That's 15 MHz up and 15 MHz down from center. Most of the newer radios have been designed to allow a greatly increased range.

Your radio may operate better 'out of band' towards the bottom half of the workable range, and the next radio may operate better towards the top half.

The modifications presented here deal with opening up the microprocessors allowable frequency range. After a modification has been done, the microprocessor will tell the VCO/VXO circuitry what frequency to operate on. Can the current tuning of the RF coils and the circuitry operate at the desired frequency? That is the big question.

The tuning of the coils and VCO/VXO circuitry can be changed. These changes go well beyond the scope of this publication.

ACCURACY AND NEW MODIFICATIONS

The authors have made every attempt to present all the available modifications. As new radios and modifications become available, they will be added to the next publication. Outside contributions are accepted. A number of useful graphs, charts and tables are provided in the appendices.

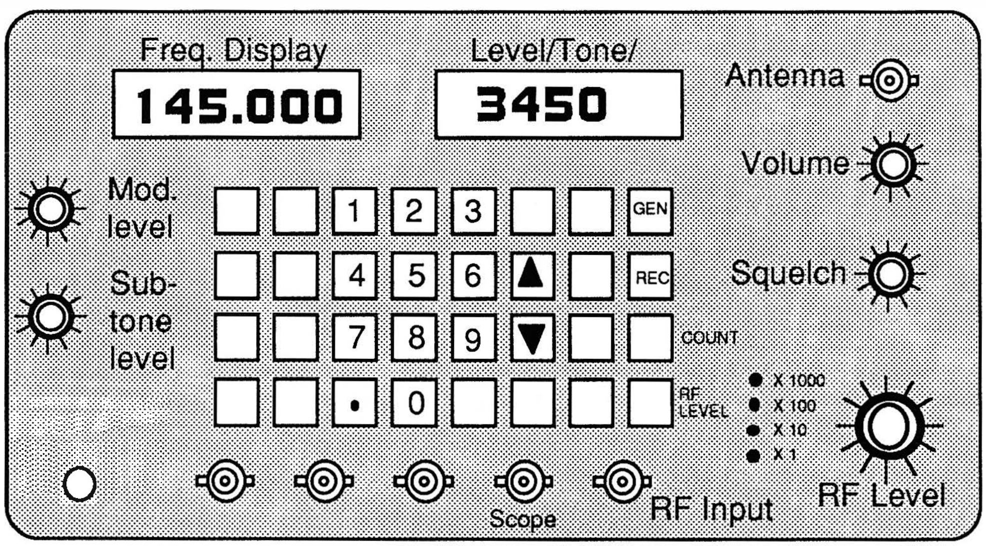
Technicians are welcome to forward comments, suggestions and new modifications. Forward your modifications to our mailing address or FAX a copy to us.

SERVICE TOOLS

The cost of a service monitor, even the least expensive model, is over $2,000. You may be able to pick up a used unit for around $500. If you do manage to find a used service monitor, take it to be tested or calibrated on a new service monitor.

A service monitor performs a number of functions that are invaluable in aligning all types of radios. It can generate a signal on an exact frequency and allow you to control the signal strength and the amount of modulation applied to the signal. This feature will allow you to properly align the S-Meter and test the receiver sensitivity. A good receiver has a sensitivity of less than .2 micro volts.

Service Monitor



Perhaps the most valuable feature of a service monitor is its ability to act as a receiver and measure the frequency error & modulation.

Frequency error is measured in Hertz. A normal transmitter can be aligned or tuned up or down by as much as 5 kHz. (5,000 Hz). Most radios have an alignment control that will allow you to adjust the frequency up or down. A transmitter should be exactly on frequency. Within 200 Hz plus or minus is acceptable.

Measuring the modulation of a signal will allow you adjust the transmitters microphone audio, DTMF pad and Sub-audible tone levels.

Suggested modulation levels:

Audio (microphone)	3,500 - 4,000 Hz
DTMF (touch tone)	3,000 - 3,500 Hz
PL (Sub-audible tone)	600-650 Hz

Alignment controls for these levels are available in most radios.

Other Valuable tools

There are a number of other tools that are a great deal less expensive than a service monitor. Most of these tools you should have in your tool box. If you do not have these tools, it a good idea that you invest a few dollars and pick them up.

Soldering iron

The modifications in this book require a 30-40 watt soldering iron. Make sure you have a small tip for the iron. A soldering gun is much to big. If you have one of the old guns, put it away until you are assembling a PL connector.

Some of the components used in the new radios are smaller than the letters in this sentence. You will need a steady hand and some experience desoldering components. A supply of solder braid is often the best method of removing a component.

Magnifying glass

Don't make a mistake here. The parts in the modern radios are small. You may not need one on some older radios, but open up one of the newer radios and you will wish one was handy.

Digital Volt/OHM Meter (DVM)

You must get one of these. They are handy for many things. Try to get one that has a continuity tone setting. An auto ranging meter is the best. If you can afford it, get one that has an auto shut off feature.

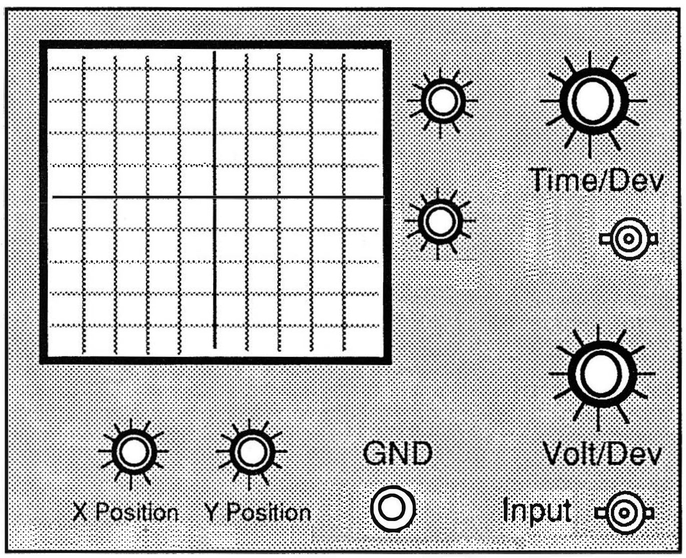
Nothing is worse than grabbing your meter and finding the batteries are dead because you forgot to shut it off the last time you used it.

POOR MAN'S SERVICE TOOLS

If you are like most of us and can not afford a service monitor, there is a method available using inexpensive tools and a little help from a friend.

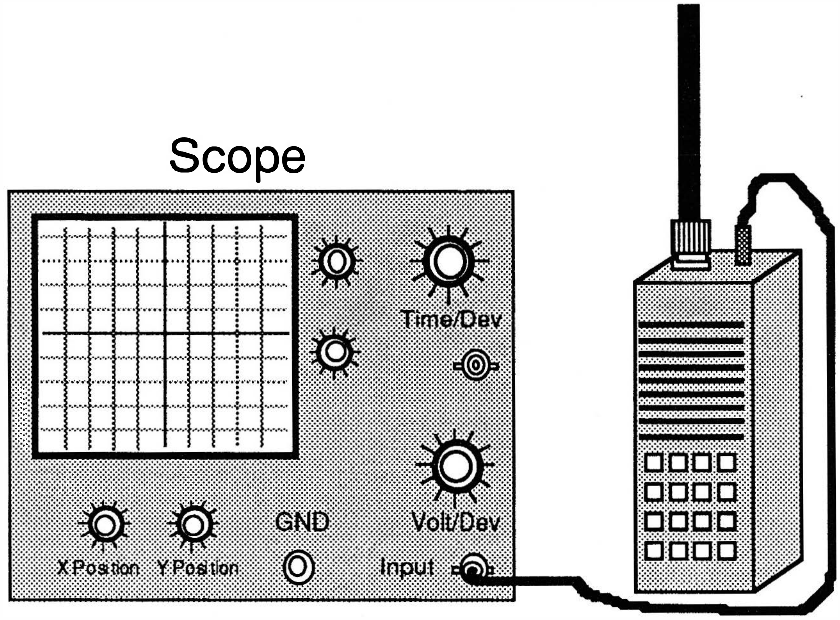
An oscilloscope is probably the most valuable instrument you can have. The cost of a new unit ranges from $250 up. A used unit can be purchased for as low as $50.

Scope

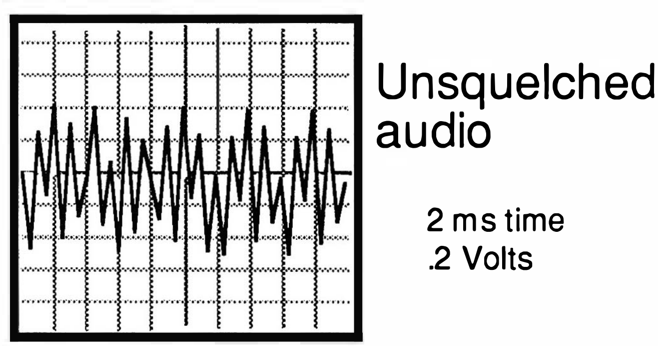


By connecting the receiver audio output (from the speaker jack) to the oscilloscope input, you can get an accurate visual view of the audio wave. With a little practice, you can accurately measure the audio levels.

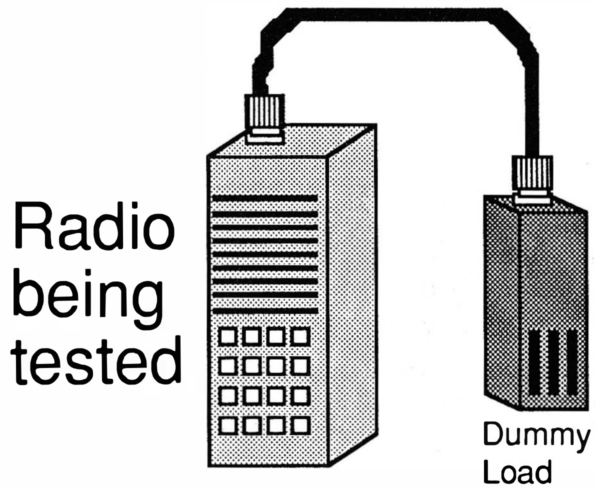
If you are tuning up a transmitter, or the transmitter section of a transceiver, you will need the use of another receiver. If you have or can borrow a friend's handi-talkie, it will work just fine.



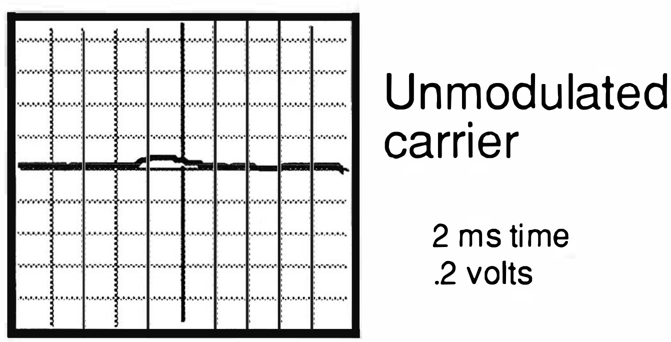
Connect your friends radio up to the oscilloscope via the external speaker jack. Turn the radio and oscilloscope on and adjust the receiver audio level to about 1/3. Turn the squelch off. Turn the Volt/Dev control to adjust the waves until they fill 1/2 of the display.



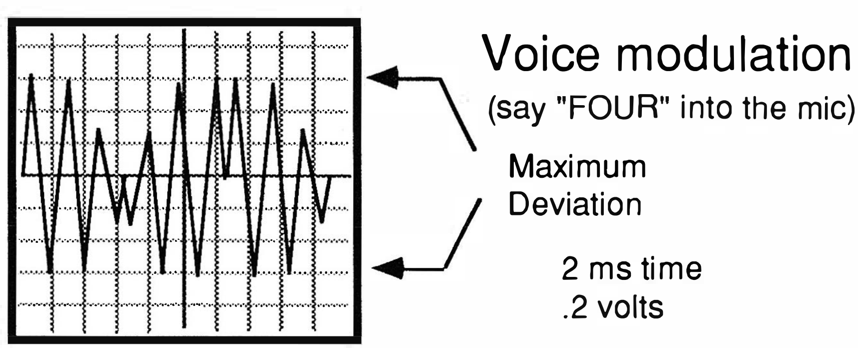
There is a fine tuning control for both the Volt/Dev and Time/Div controls. Place them in the center position until you are ready to adjust the scope display discussed below.



Now using your transmitter, press the PTT. (Make sure you are using a dummy load). The scope display should appear below.



Now that you have the scope set up. Press the PTT key and talk into the microphone and watch the display. Hold the mic 3-4 inches away and say "FOUR" into the mic. Stretch the "FOUR" for 5 seconds.



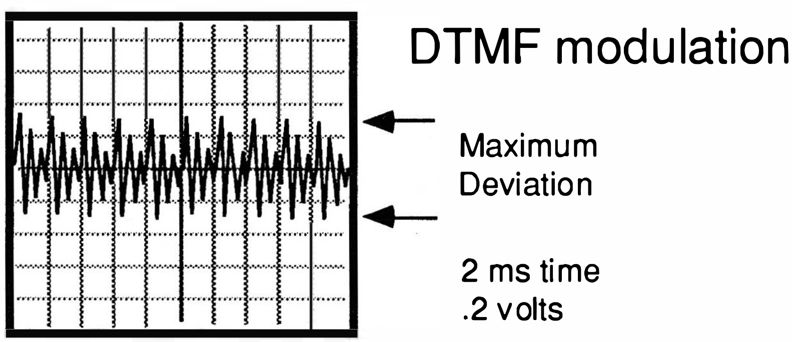
The pattern on the scope is not as important as the maximum height of the wave crests.

The simplest testing method to see if your radio is accurately adjusted is to compare its signal to another radio that is operating properly. Transmit with the "GOOD" radio and adjust the scopes Volts/Div control to place the audio peaks at the markers as shown in the example above.

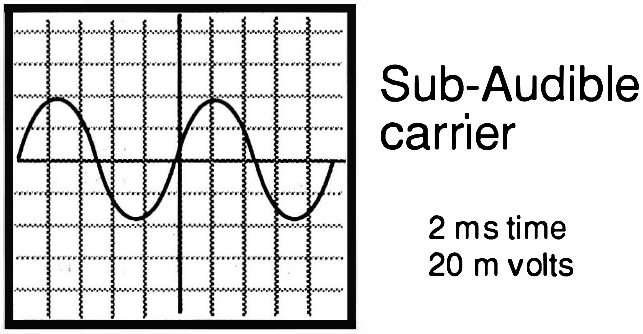
Now transmit with your radio and compare where the voice peaks are placed. If they are higher, adjust the Modulation/Deviation controls in your transmitter to a lower position. If they are lower, increase the controls position.

If possible, adjust the modulation/deviation control while you are transmitting and modulating.

You can adjust the levels of the DTMF key pad using the same method used on audio modulation. All DTMF tones have a rhythmic shape on the scope display. The DTMF tones will be lower in level that audio peaks. This is normal.



You can also adjust the level of the Sub-Audible PL tone using the scope. It will be necessary to adjust the Volt/row control to be more sensitive. A PL tone is only 20% the level of the voice modulation. Adjust the control to approx. 20 milli volts. Do not modulate the carrier with audio while you are adjusting the PL level.



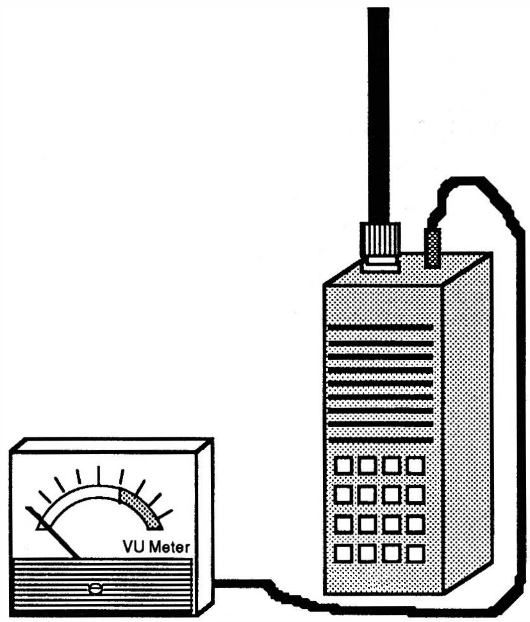
Some receivers will filter out the sub-audible tone before it appears at the speaker jack. Most of the newer receivers do not do this so you should have no trouble watching the sub-audible wave form. If you can not get the expected wave form, check to make sure the transmitter is encoding PL tone. You should also check the receivers PL decode is turn off.

If you have gone this far, watch the display when you modulate a carrier that has a sub-audible tone. You will still see the tone no matter what type of modulation you use.

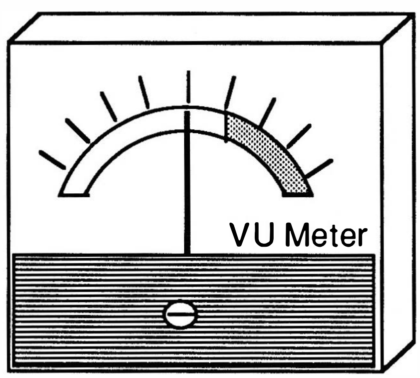
A more inexpensive method.

There is another method of checking the audio deviation levels using a audio VU meter. A VU meter can be purchased at your local Radio Shack. You can purchase the meter by itself, or in a case ready to hook up to your stereo.

Connect the VU meter to the speaker jack of your friend's radio or receiver.



Using a properly working transmitter, transmit and hold down a DTMF tone key and adjust the receivers volume control to cause the VU meter needle to set at the half-way point.



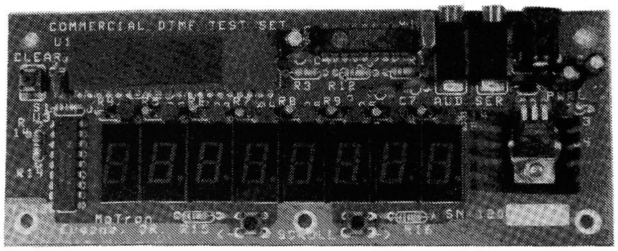
Adjust receiver volume to set meter at half-way position

Again press the PTT and measure where normal speaking audio causes the needle to peak.

Now using the radio to be tested, perform the same tests and adjust the transmitters deviation controls to match the levels of the other radio.

This method will not work accurately enough to test sub-audible tone levels.

HEAR THE TONES. . .SEE THE NUMBERS!



*EIGHT DIGIT DISPLAY
*32 CHARACTER MEMORY
*ASCII SERIAL OUTPUT

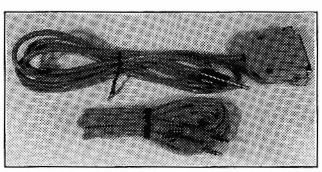
MoTron TDD-8 TOUCH-TONE DECODER DISPLAY AND ASCII CONVERSION BOARD

The MoTron **TDD-8** is a wired and tested commercial touchtone test decoder board. The **TDD-8** decodes and displays all 16 touch-tone signals. The eight digit display, 32 character memory and left-right scroll function allows the user to capture and display up to 40 characters without loss of information. An ASCII serial output can be connected to a computer for automatic logging or remote data entry. The MoTron "Tonelog" IBM compatible software package is included with each TDD-8 at no additional charge. The computer interface cable can be purchased separately if needed.

Connect to almost any audio source - The MoTron **TDD-8** can be connected to a scanner, communications receiver, tape recorder, telephone answering machine etc.

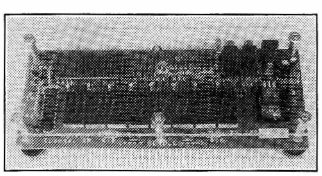
IBM compatable software included - The **TDD-8** is a stand-alone device and does not need to be connected to a computer for decoding and displaying touch-tone digits. However, a serial ASCII output is provided on the board that can be connected to the RS-232 serial port of almost any computer. This allows you to use the **TDD-8** for numerous applications. The "Tonelog" IBM compatible sofware, that is included, will automatically log the date and time a number is decoded.

TDD-8 Touch-tone decoder with eight digit display, 32 character memory and ASCII serial output (wired/tested circuit board).. **$99.00**



CAB-1 - Includes audio and computer cables. Audio patch-cord can be connected to most scanner and receiver speaker or earphone jacks. Mini phono plugs (3.5mm) on each end. Computer cable has mini phono (3.5mm) plug for connection to the TDD-8 and female DB-25 on the other end for computer connection.............................. **$20.00**

PS-12 - 110VAC adapter.............................. **$10.00**



PMK-1 - Plastic Mounting Kit. This is not a complete enclosure, but offers a simple means of protecting the board, making it easier to handle and use. Kit includes hard plastic sheets to cover the bottom and top of the board. Also included are rubber feet, spacers, nuts and bolts **$15.00**

ADD $5.00 FOR SHIPPING AND HANDLING. VISA/MC ACCEPTED.

Satisfaction guaranteed or your money back within 30 days of purchase (less shipping/handling). 90 day warranty on parts and labor.

Specifications: Board size: 6"X 2-3/8", Power requirements: 9 to 12 VDC @200 ma, DTMF response time: 40 ms (can decode fast auto-dialers), Audio input: 100 mv to 6 Vpp, Serial output: 1200 baud, 8 data bits, no parity.

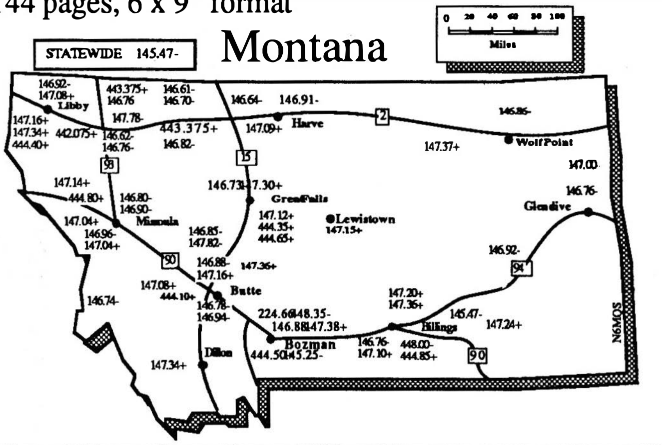
MoTron Electronics
310 Garfield St., Suite 4
Eugene, OR 97402

ORDERS: 1-800-338-9058
INFO: (503) 687-2118
FAX: (503) 687-2492

(Touch-tone is a trademark of AT&T)

U.S. REPEATER MAPBOOK #2

A repeater guide that shows where in each state principal open amateur repeaters are located. The Maps also show the important highways in each state. Tables showing the popular repeater in the states major cities are also presented. 2 meter, 200, 440 MHz and 1.2 GHz repeaters are shown. 144 pages, 6 x 9" format

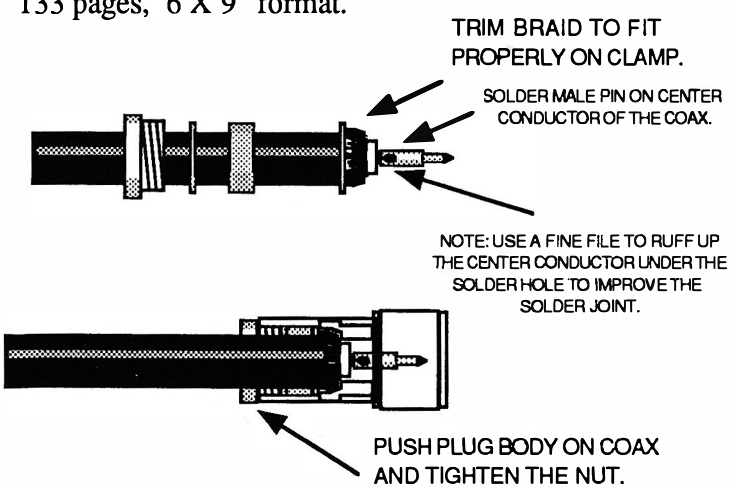


FEDERAL ASSIGNMENTS Vol 3

The Frequency assignment master file.
The complete listing of all U.S. government used frequencies listed by agency and in frequency order. Frequencies for Departments of: Agriculture, Air Force, Army, Commerce, Defence, Energy, Health and Human Services, Housing and Urban Developement, Interior, Justice, Labor, Navy, State, Treasury, Transportation and 29 Independent agencies & Commissions.
Over 350 pages, 8 1/2 X 11" format

AMATEUR HAMBOOK

Equipment & Log Sheets, Charts, Tables showing: worldwide callsigns, world times, shortwave listening frequencies, coax losses, CTCSS details, conversions, construction plans, emergency information, etc.
This book contains all the useful information a amateur radio operator needs to reference.
133 pages, 6 X 9" format.



artsci

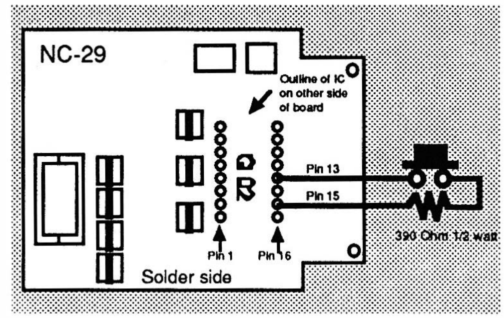
P.O. Box 1848
Burbank, CA 91507
(818) 843-4080
FAX: (818) 846-2298

RADIO/TECH MODIFICATIONS # 5A

Modifications and alignment controls for ICOM & KENWOOD amateur radios, and UNIDEN, RADIO SHACK & REGENCY Scanners. Over 200 pages, 8 1/2" X 11"

RADIO/TECH MODIFICATIONS # 5B

Modifications and alignment controls for ALINCO, YAESU, STANDARD, AZDEN radios and 10 meter & CB radios.



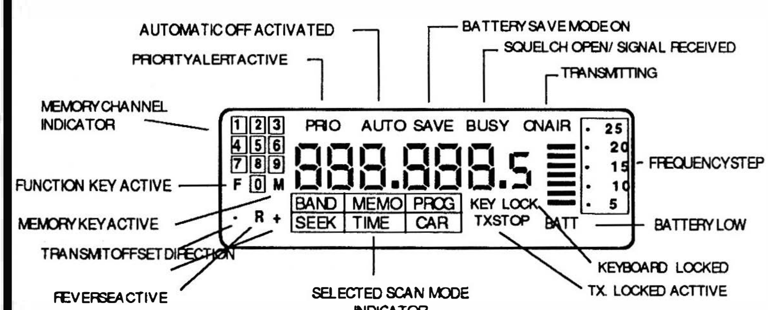
HAM RADIO RESOURCE GUIDE

For Southern California only. A booklet of all the information an amateur radio operator needs. Listings of clubs, testing centers, sario stores and surplus dealers. Maps of repeaters, store and swap meet locations. Listing of Packet repeaters, phone BBS and node lists. 64 pages 8 1/2" X 5 1/2"

NORTH AMERICAN SHORTWAVE FREQUENCY GUIDE

Accurate and complete listing of all English and Spanish broadcasts on the 0 - 30 MHz shortwave bands. Listing are presented in frequency order. Over 200 pages, 8 1/2" X 11"

LOST USER MANUALS



Lost the manual for your HT or Mobile rig? Did you purchase a used radio and it did not come with a manual? Do you have the manual but still can work the radio quickly?
"LOST USERS MANUALS" contains operating instructions for all the popular amateur radios and scanners. ICOM, Yaesu, Kenwood, Alinco, Standard, Uniden and other manufactors radios. Each radio is given 2 to 5 pages of drawing, charts and programming instructions. Over 140 Pages, 8 1/2 X 11" format.

Radio / Tech Modifications

ICOM Radio Modifications

Radio / Tech Modifications

ICOM Radio Modifications

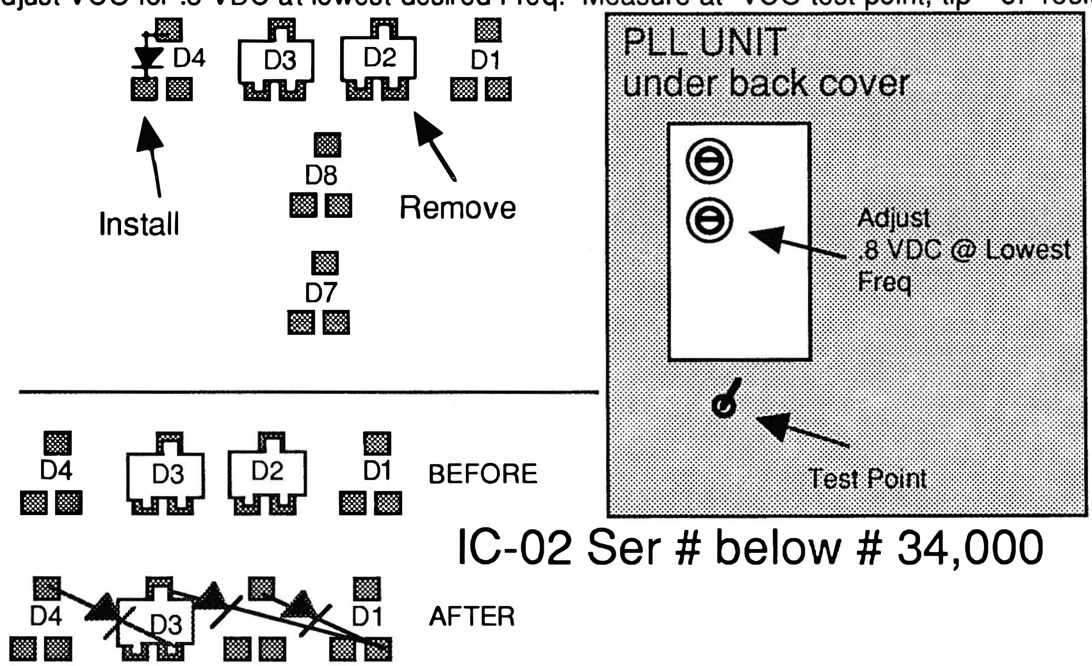
Model **Modification** **Page #]**

ICOM IC-02AT

EXPANDED RF/ SCAN RATE INCREASE

1. Remove battery and antenna.
2. Remove screws open case.
3. Locate and remove chip diode D2 on Logic unit.
4. On 02's with ser # over 34,000 - Install a diode across pads of diode D4 (see drawing) 1N4148 or 1SS211
5. On serial #'s below 34,000 install three diodes. (see drawing)
6. Locate R413 on logic board, it is located below the right hand corner of the microprocessor. The letters C6 are printer above it and 13 is below it.
7. Attach (piggy-back) another 270,000 resistor on to R413. (Scan Mod) A very small resistor is required. If you use a 1/8 watt or larger use wire rap wire to mount it our of the way.
8. Reassemble the radio.
9. Reset the microprocessor. (ser#<34000 Push button next to litho batt, on >34000 Hold [FUNCTION] and turn power on

Note Adjust VCO for .8 VDC at lowest desired Freq. Measure at VCO test point, tip of resistor R253.



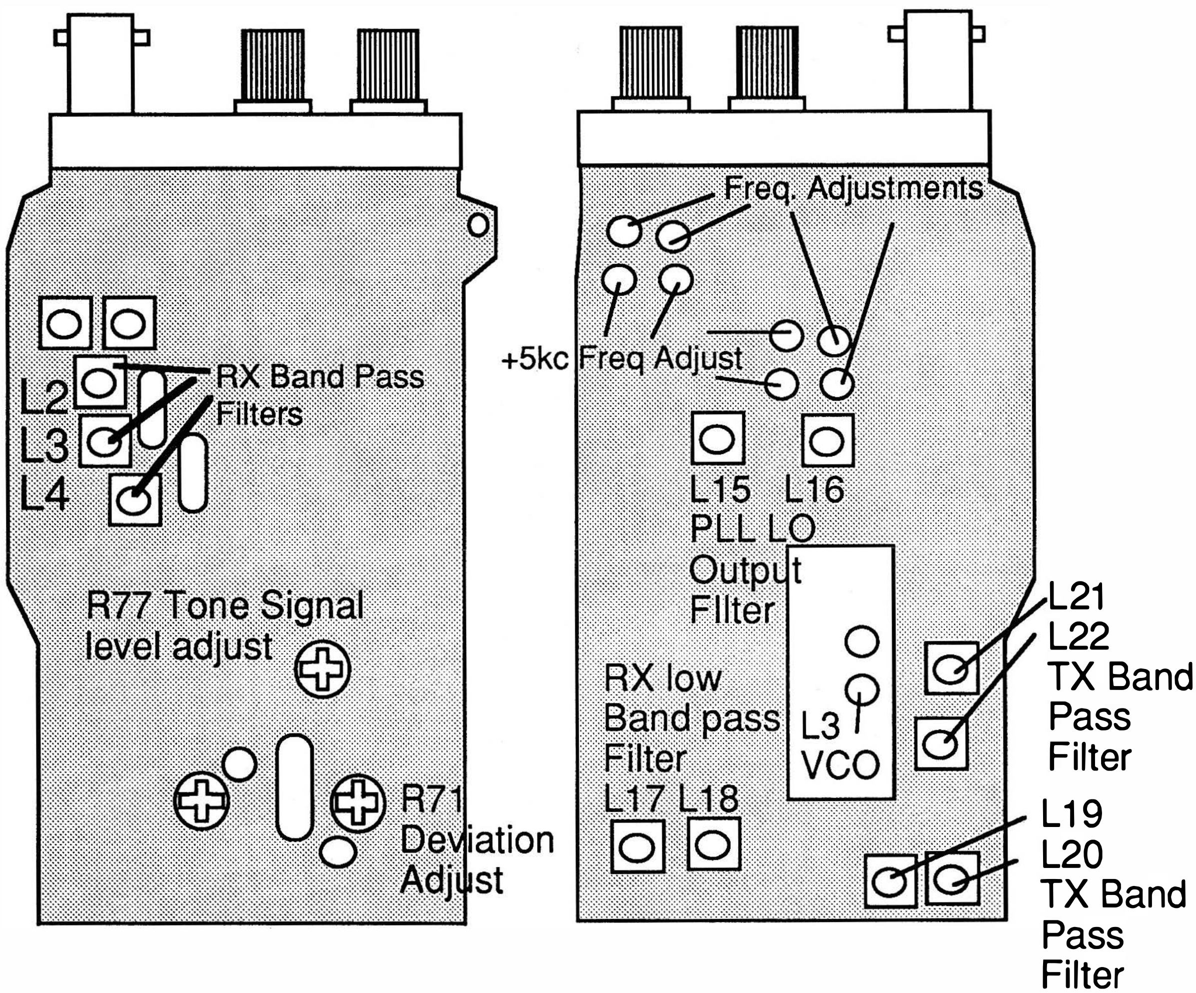
IC-02 Ser # below # 34,000



Caution

ICOM IC-2A/AT

ALIGNMENT CONTROLS



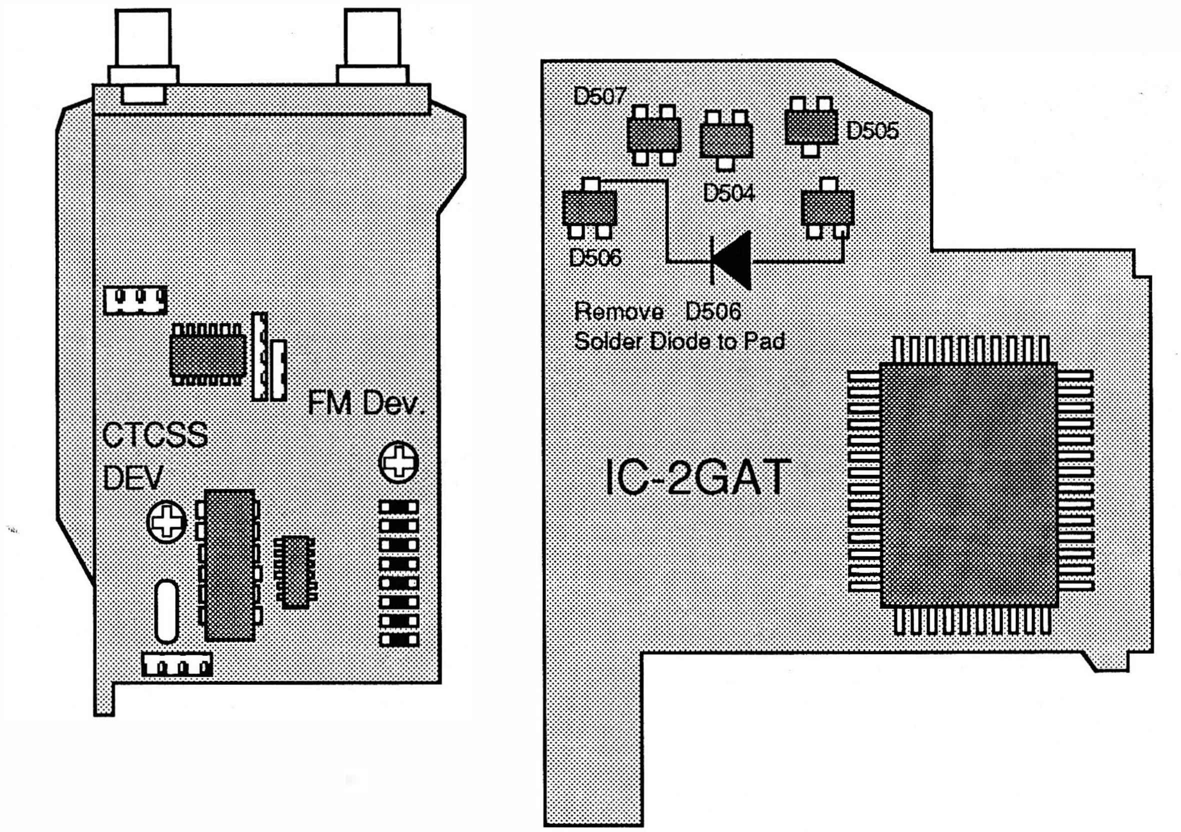
Caution

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ICOM IC-2GAT

EXPANDED RF

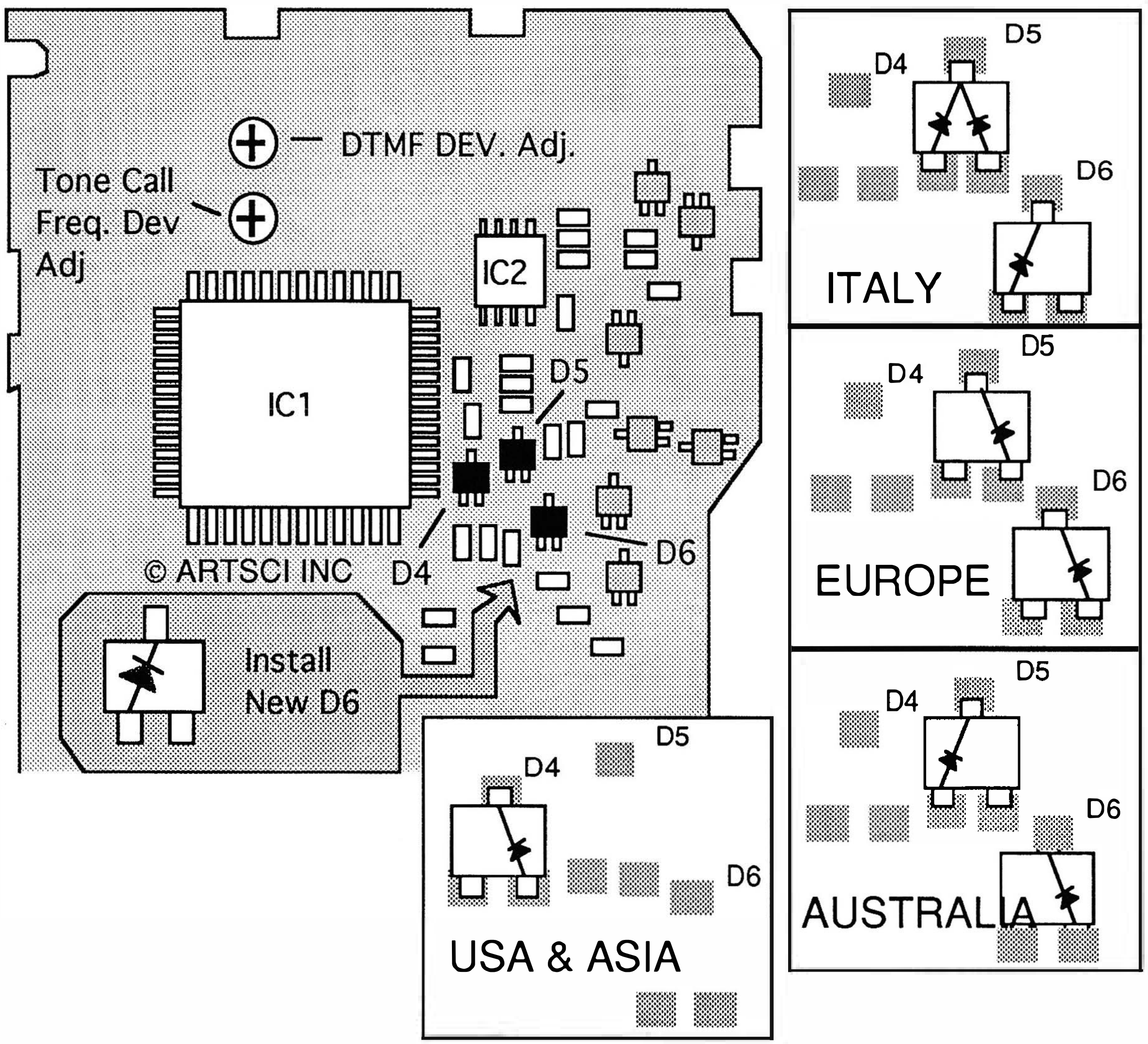
1. Remove battery and antenna.
2. Remove screws and open radio
3. Remove D506 (this part is already removed on US version)
4. Attach diode as shown (Use 1N914 or equivalent Diode)
   Make sure Diode leads will not short anything. Cover them in tape.
5. Reassemble the radio
6. Reset the radio. (Turn radio on, Hold [LIGHT] & [FUNCTION], turn radio off and back on)



ICOM IC-2SA, 2SAT & 3SAT

EXPANDED RF

1. Remove battery and antenna.
2. Remove screws and open radio.
3. Locate and remove diode D9 on LOGIC A unit (Already removed on USA version)
4. Remove chip diode D6. (Already removed on USA version)
5. Solder install a chip diode (DA114) in place of D6 position.
   A 1N4148 or other diode can be used if extreme caution is taken.
6. Reassemble the radio.
7. Reset the microprocessor. (2SAT: Press & hold [#], [B] & Light, Turn power on)



MORE ----



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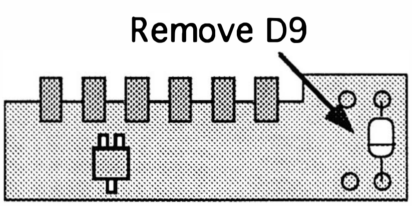
ICOM IC-2SA, 2SAT & 3SAT

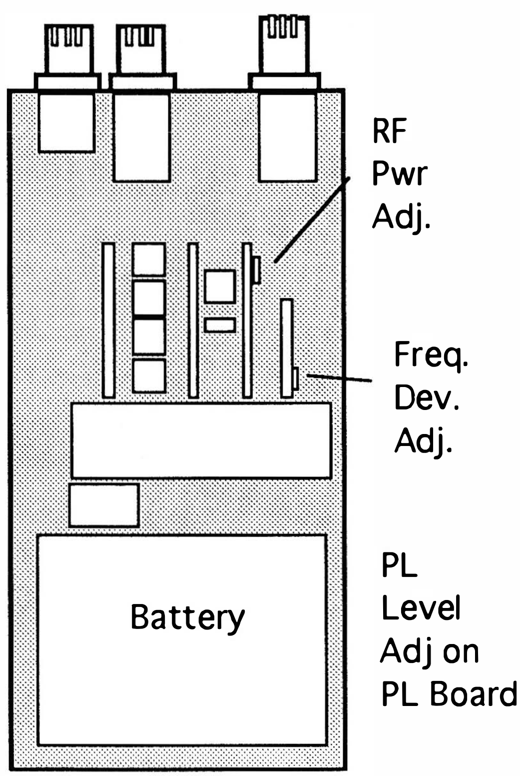
ALIGNMENT POINTS

2SAT Range   RX 108-140 AM, 138-169 FM, 310-370 FM   TX 139 - 163 FM

Optional Commands: Push [LAMP] & [Keyboard Key, see below] and Power on.
[1] Enter 4 digits, [2] Enter 5 digits, [3] Enter 6 digits,
[4] Pause Scan, [5] to see timer scan, [7] PS off
[8] PS 1:4 125 msec on/500msec off, [9] PS 1:16
[0] PTT Disable, [*] PTT Enable, [#] PTT Disable
[A] Reset, [D] Display Test

IC2SAT







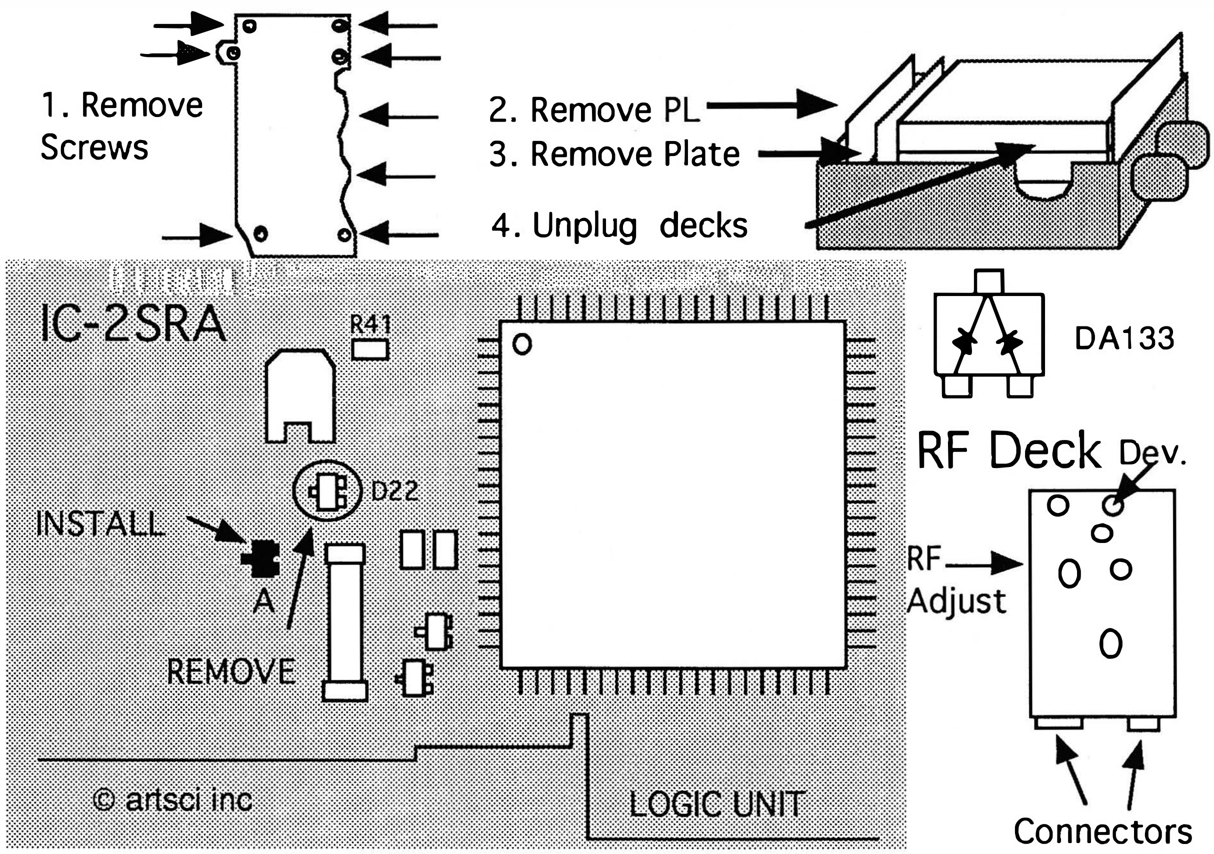
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ICOM IC-2SRA

EXPANDED RF

1. Remove battery and antenna.
2. Remove screws from back panel and battery plate and open radio.
3. Remove PL deck and power plate.
4. Unplug VHF & Receiver decks.
5. Remove Chip diode D22.
6. Attache Chip diodes to location point D16 point A (MA133).
   (Diode MA133 - Icom part # 1790000860)
7. Reassemble the radio.
8. Reset the CPU (Push and hold [FUNCTION} & [A] & [CLR] and turn radio on)



IC-2SRA KEYBOARD COMMANDS:

RX Expansion — Push and hold [CALL] & [F] & [LIGHT] and turn power on.
D9 on "RES" board may need to be removed

RANGE: 126 - 190 MHz



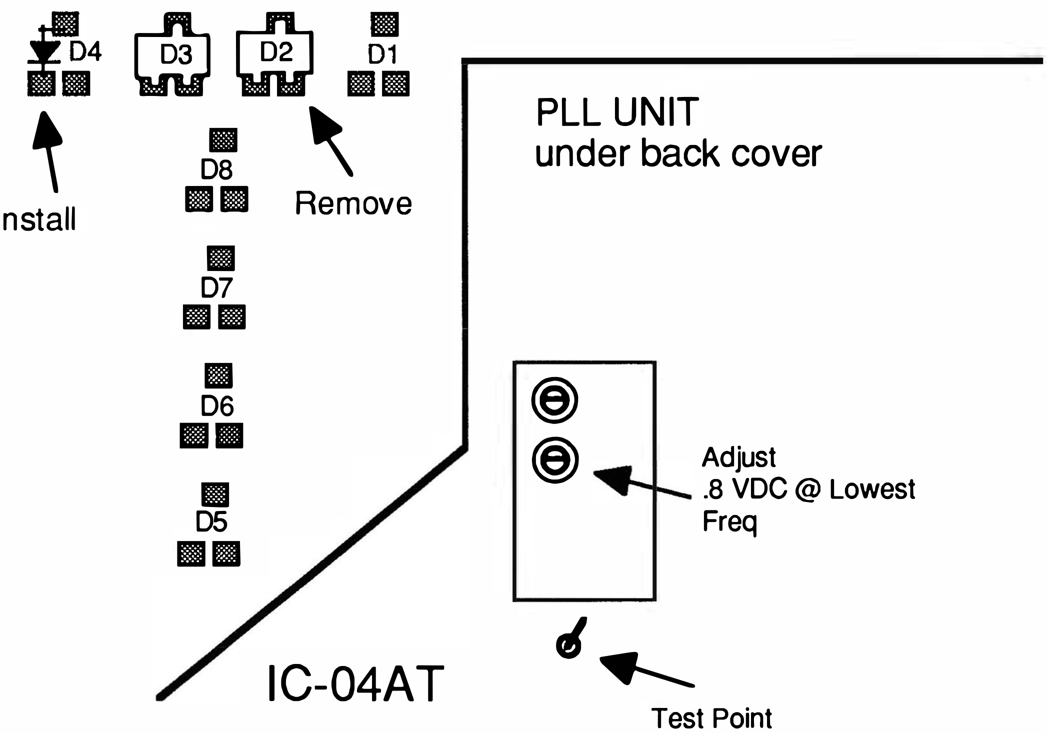
Caution

ICOM IC-04AT

EXPANDED RF

1. Remove battery and antenna.
2. Remove screws open case.
3. Locate and remove chip diode D2 on Logic unit.
4. On 02's with ser # over 34,000 - Install a diode across pads of diode D4 (see drawing) 1N4148 or 1SS211
5. On serial #'s below 34,000 install three diodes. (see drawing)
6. Reassemble the radio.
7. Reset the microprocessor. (ser#<34000 Push button next to litho batt, on >34000 Hold [FUNCTION] and turn power on

Note Adjust VCO for .8 VDC at lowest desired Freq. Measure at VCO test point.



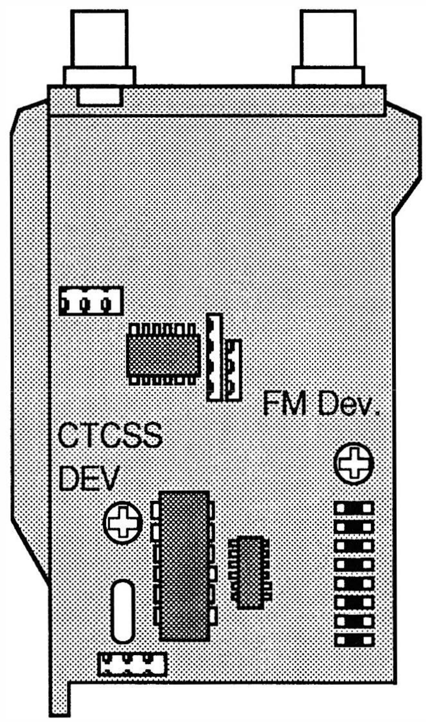

Caution

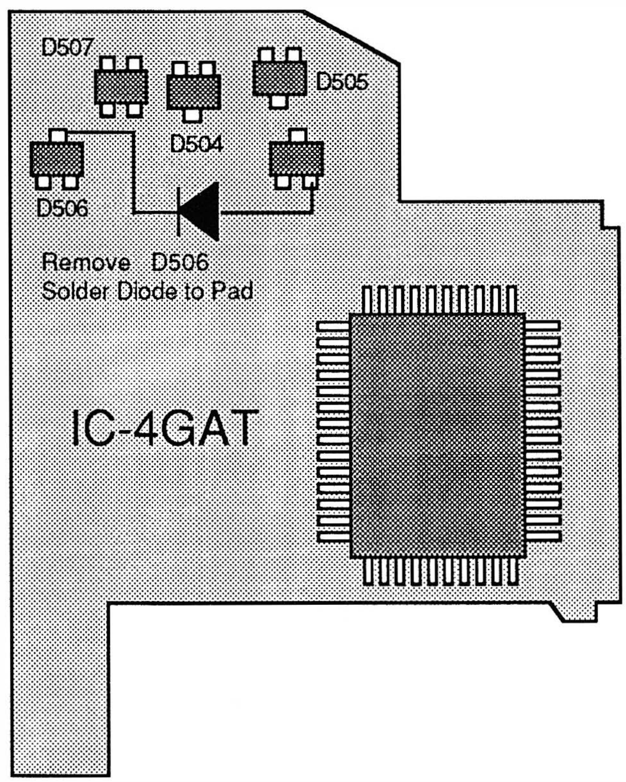
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ICOM IC-4GAT

EXPANDED RF

1. Remove battery and antenna.
2. Remove Screws and open radio
3. Remove D506 (this part is already removed on US version)
4. Attach Diode as shown (Use 1N914 or equivalent Diode)
   Make sure Diode leads will not short anything. Cover them in tape.
5. Reassemble the radio.
6. Reset Radio. (Turn radio on, Hold [LIGHT] & [FUNCTION], turn radio off and back on)



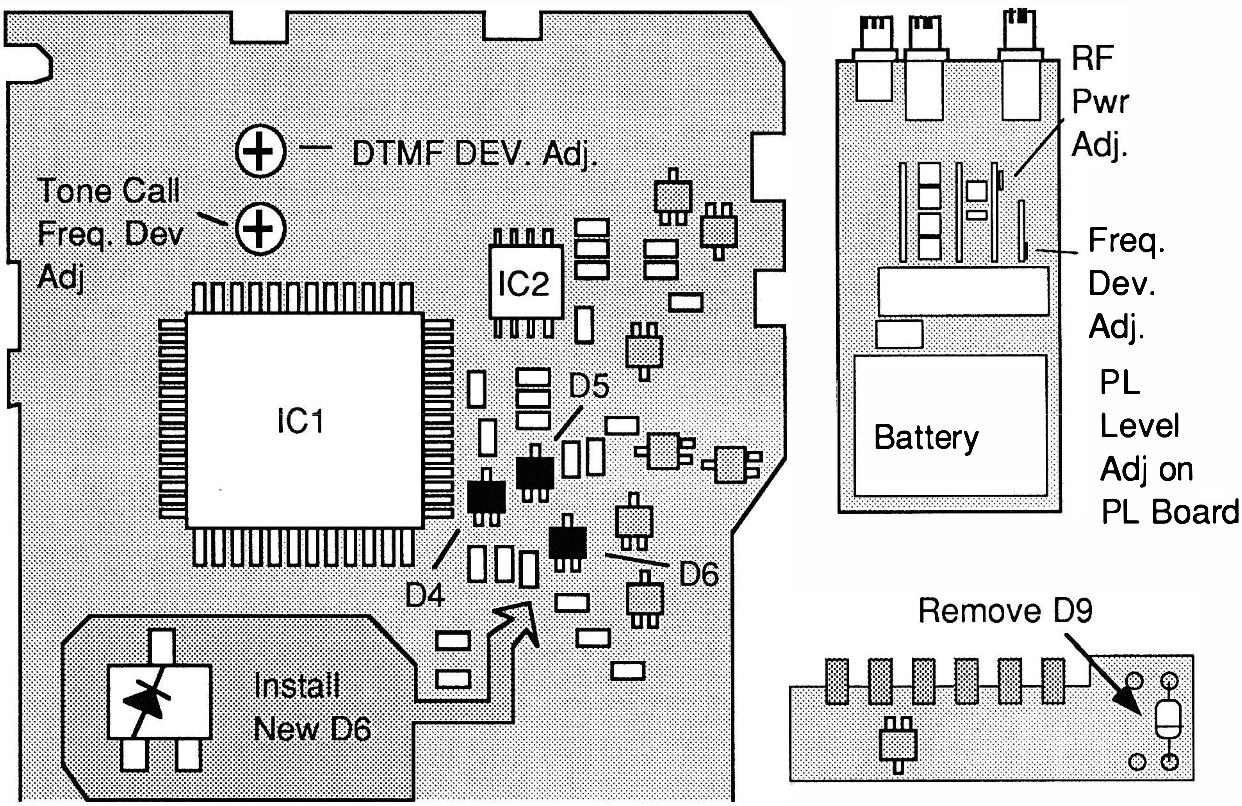



Caution

ICOM IC-4SAT

EXPANDED RF

1. Remove Battery and antenna.
2. Remove Screws and open radio.
3. Locate and remove diode D9 on LOGIC A unit (See Drawing)
4. Solder install a chip diode (DA114 T107) in position D6.
   A 1N4148 or other diode can be used if extreme caution is taken.
5. Reassemble the radio.
6. Reset the microprocessor. (Press & hold [#], [B] & Light, Turn power on)



4SAT Range 435 MHz - 465 MHz. (any 30 Meg Segment from 400-490)

Optional Commands: Push [LAMP] & [Keyboard Key, see below] and Power on.
[1] Enter 4 digits, [2] Enter 5 digits, [3] Enter 6 digits,
[4] Pause Scan, [5] to see timer scan, [7] PS off
[8] PS 1:4 125 msec on/500msec off, [9] PS 1:16
[0] PTT Disable, [*] PTT Enable, [#] PTT Disable
[A] Reset, [D] Display Test

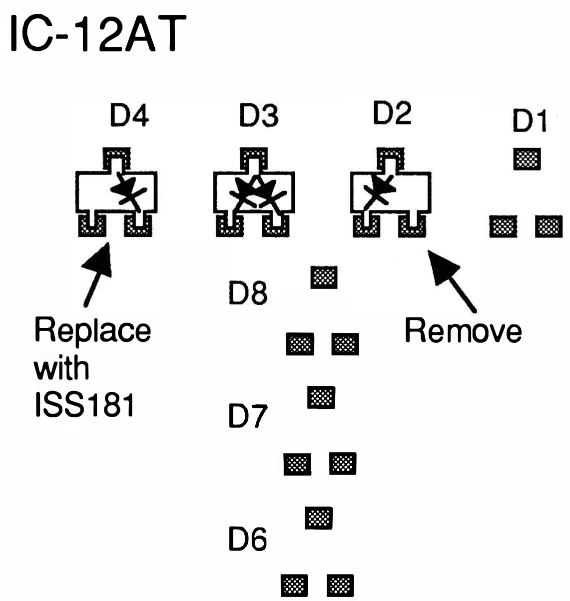
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ICOM IC-12AT

EXPANDED RF

1. Remove battery and antenna.
2. Remove Screws and open radio.
3. Locate and remove diode D2 (See Drawing)
4. Replace diode D4 with ISS 181 (A3)
5. Reassemble the radio.
6. Reset the microprocessor.(Hold [FUNCTION] and turn power on)

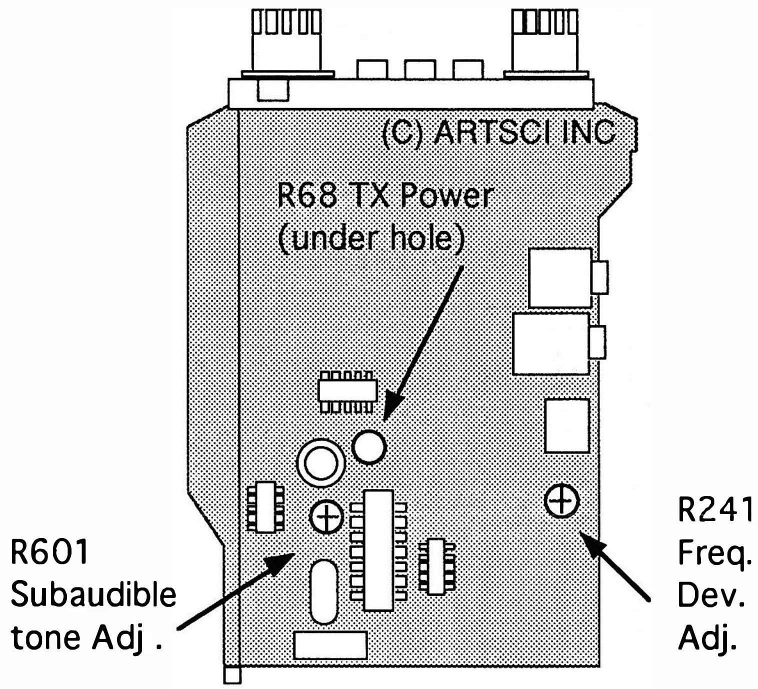




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ICOM IC-12GAT

ALIGNMENT CONTROLS

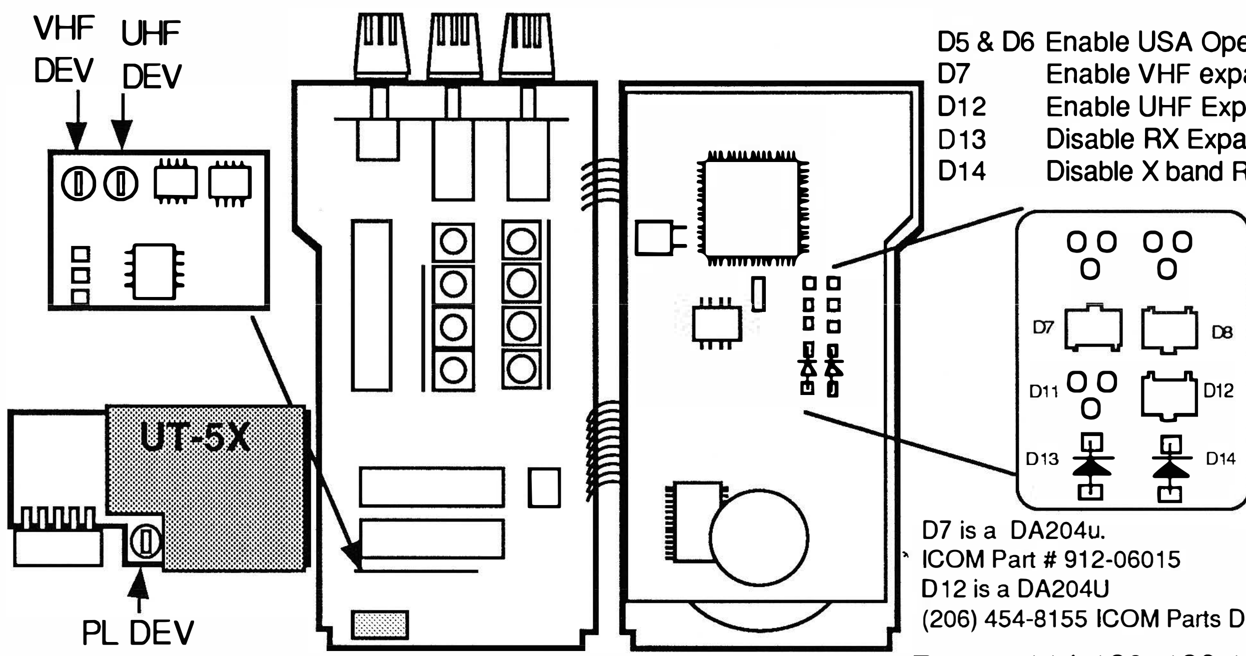




ICOM IC-24

EXPANDED RF/ Crossband Repeater

1. Remove battery and antenna
2. Remove Screws and open radio
3. Remove Diode D8.
4. Remove Diode D14 (Crossband Repeater)
5. Remove Diode D13 (Expanded RX)
6. Attach Diode DA204u to position D7
7. Attach Diode DA202u to position D12. Note some models require a DA204u.
8. Reassemble the radio.
9. Press and hold [light] & [B] & [#] and turn power on.
   Note: Press and hold [light] & [3] and turn power on for direct Freq entry.
   [light] & [2] will reset the radio for 10MHz input operation.



D5 & D6 Enable USA Operation
D7 Enable VHF expansion
D12 Enable UHF Expansion
D13 Disable RX Expansion
D14 Disable X band RPTR.

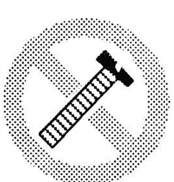
D7 is a DA204u.
ICOM Part # 912-06015
D12 is a DA204U
(206) 454-8155 ICOM Parts Dept.

Range: 114-130, 138-192, 403-485 & 825-903

CROSS BAND REPEATER PROCEDURES (VFO MODES ONLY)

TURN ON - HOLD [FUNCTION] & PRESS [C] THEN [5] THEN [D]
TURN OFF - HOLD [FUNCTION] & PRESS [D]

Note: When Transmitting in the 825-900MHz range, the unit is simultaneously transmitting in the 400-450MHz band!!

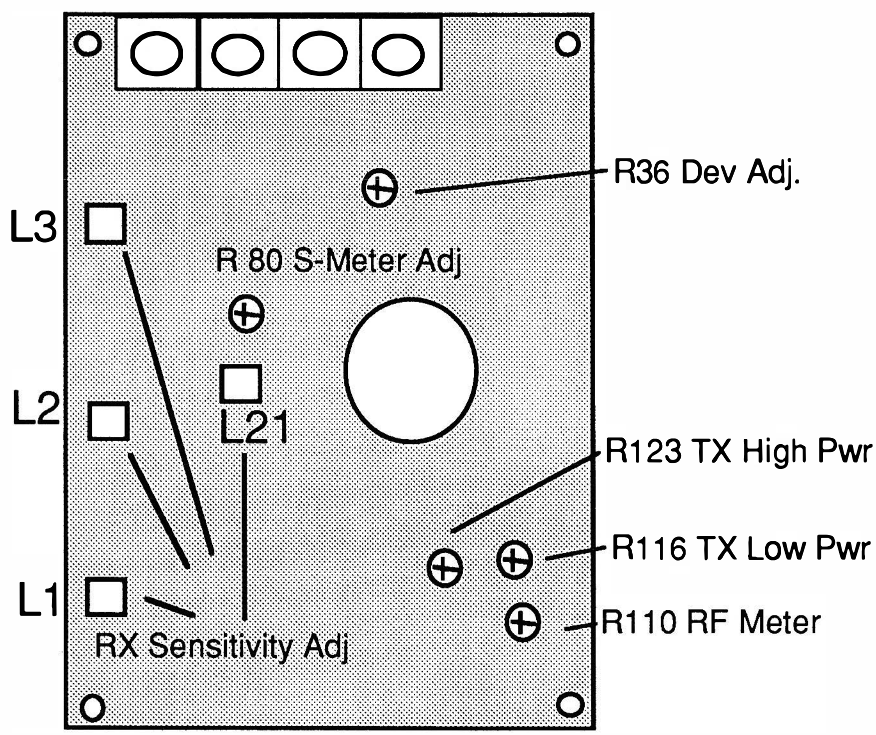


Caution

ICOM IC-25

EXPANDED RF (keyboard mod)

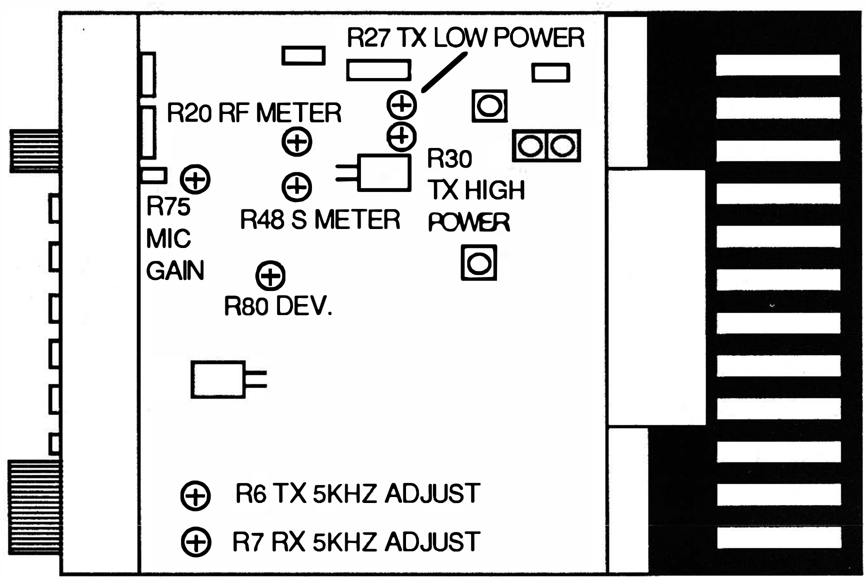
1. Set offset to 0.0
2. Select VFO (A).
3. Press and hold [SIM/DUP] and [NOR/REV].
4. Dial in desired frequency.
5. Release [SIMP/DUP] button.
6. Select the other VFO (B).
7. Repeat steps 3, 4 and 5
   If VFO (B) can not be set, transfer VFO (A) to VFO (B) usinf the [WRITE] button as described on page 7, item 6, of the owners manual.
   (NOTE: [SIMP/DUP] button must be out whe nthe VFO is changed)
8. If the tuning knob is turned again, the radio will revert back within the normal band range.



Caution

ICOM IC-27A & H

ADJUSTMENT CONTROLS



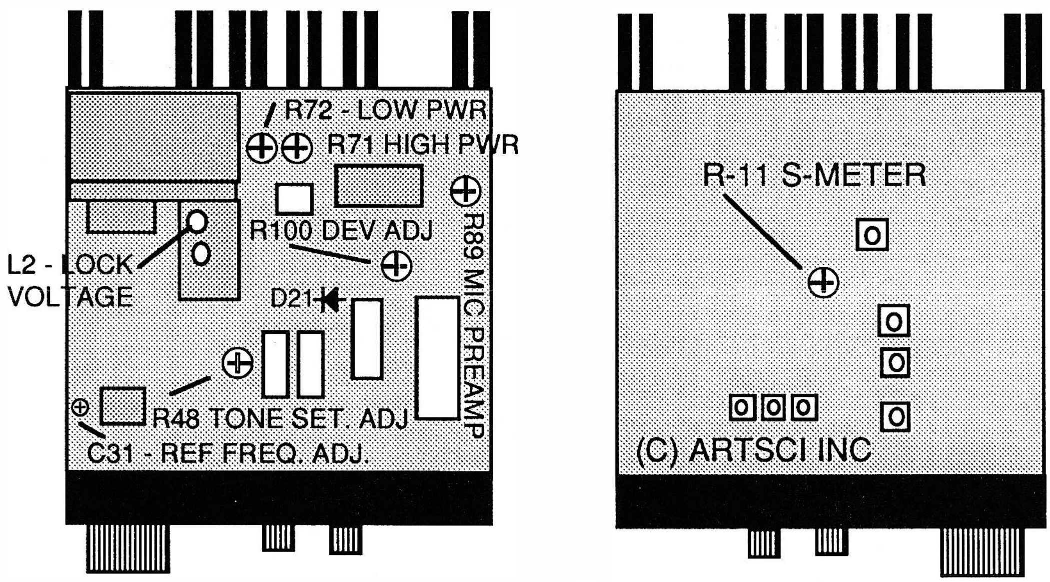
CPU Reset by pressing the Reset button under the access cover


Caution

ICOM IC-28A & H

EXPANDED RF

1. Remove Power and Antenna.
2. Remove screws and open case.
3. Locate and cut Diode D21 inside the top of the circuit board.
4. Reset the Microprocessor. (insert a toothpick in hole located in corner of bottom cover.)
5. Reassemble the radio.



IC-28



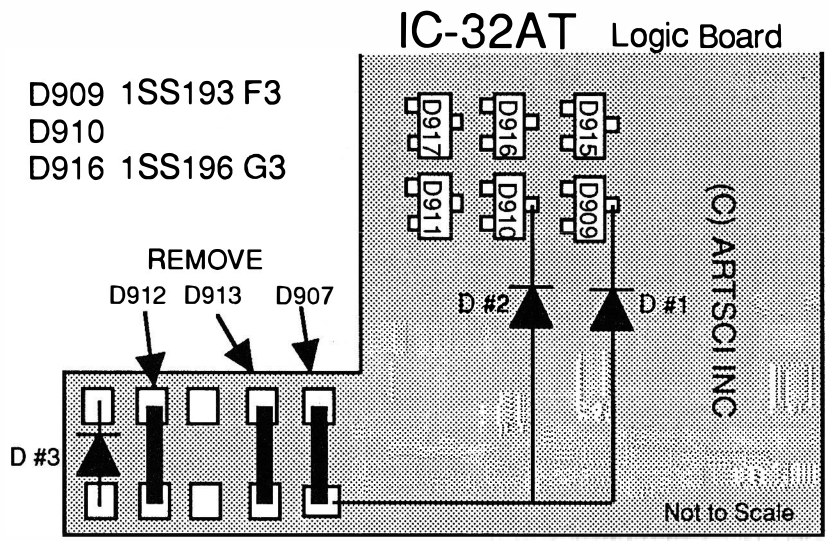
Caution

ICOM IC-32AT

EXPANDED RF / CROSS BAND REPEATER/ 10 MHZ ENTRY

1. Remove battery and antenna.
2. Remove Screws and open radio.
3. Remove D907 (150MHz+) (this part is already removed on US version)
4. Add Diode #1 (1N914).
5. Remove D913 (450MHz+).
6. Add Diode #2 (1N914).
7. Add diode #3 (1N914) 10 MHZ.
8. Remove D912 (Repeater mod).
9. Reset the microprocessor.(HOLD [FUNCTION] & [A] & [LIGHT] and turn power on)
10. Reassemble the radio.

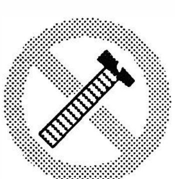
Adjust C-510 to get .25 volts at UHF test point at lowest desired frequency. C-510 is located in metal box. The test point is located next to the metal box.



CROSS BAND REPEATER PROCEDURES (Simplex Freqs only)

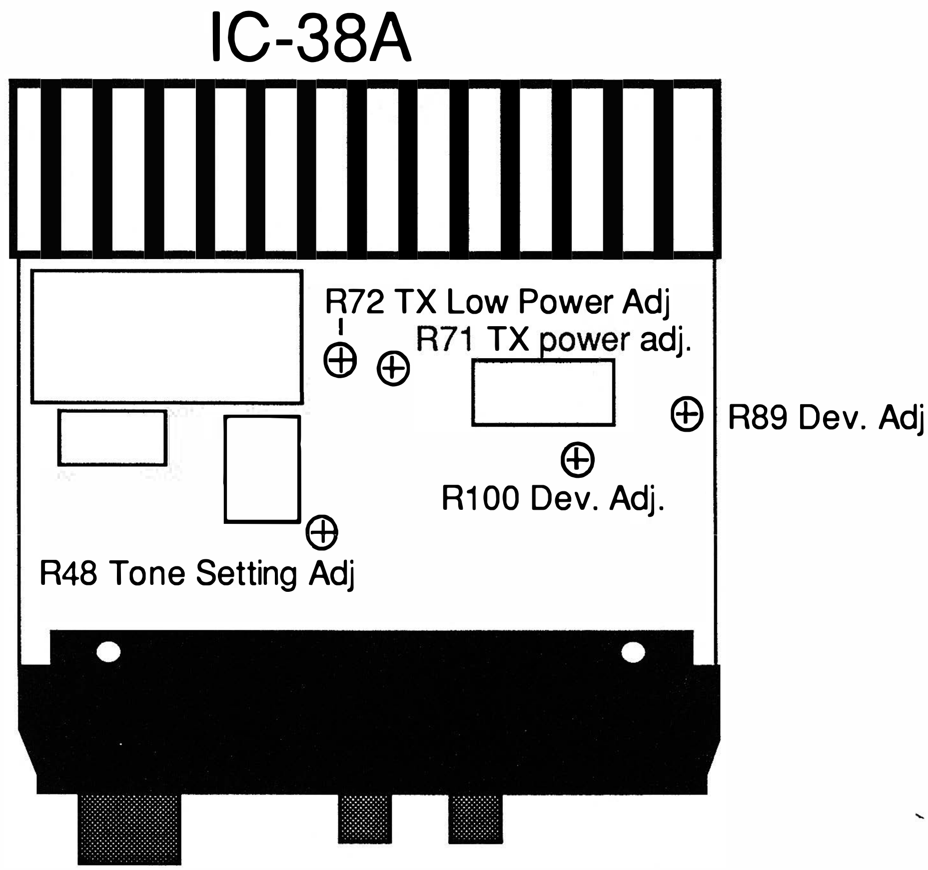
TURN ON - Press & Hold [Function], Press [C} key, Press [6] key, Press [D] key. Release Function key.

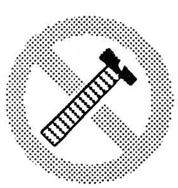
TURN OFF - Press and Hold [Function], Press [D] key, Press [C] key. Release [Function]



ICOM IC-38

ALIGNMENT CONTROLS




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Performance Report

Radio ______________________________ Date ____________

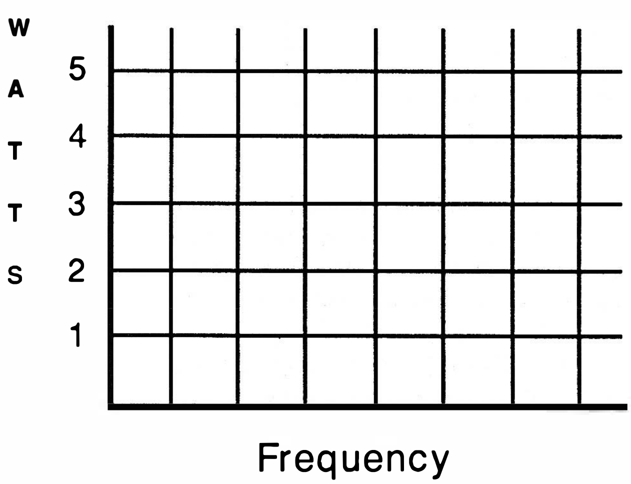
Owner : Name ____

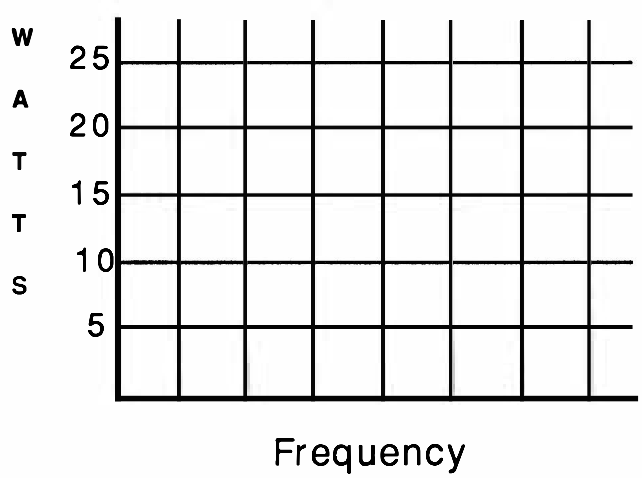
Address ______________________________________

City ____________________ St. ______ Zip ____________

Phone (   )   - ________________________________

Description	Before	After
Power out (Low)	_________ Watts	_________ Watts
Power out (High)	_________ Watts	_________ Watts
Frequency Error (Simplex)	_________ Hz	_________ Hz
Frequency Error (Offset)	_________ Hz	_________ Hz
Receive Sensitivity (Mid-band)	_________ uv	_________ uv
Receive Sensitivity (____MHz)	_________ uv	_________ uv
Receive Sensitivity (____MHz)	_________ uv	_________ uv
PL Deviation	_________ Hz	_________ Hz
DTMF Deviation	_________ KHz	_________ KHz
Audio Deviation	_________ KHz	_________ KHz
Lowest usable Freq @ .5 Pwr	_________ MHz	_________ MHz
Highest usable Freq @ .5 Pwr	_________ MHz	_________ MHz

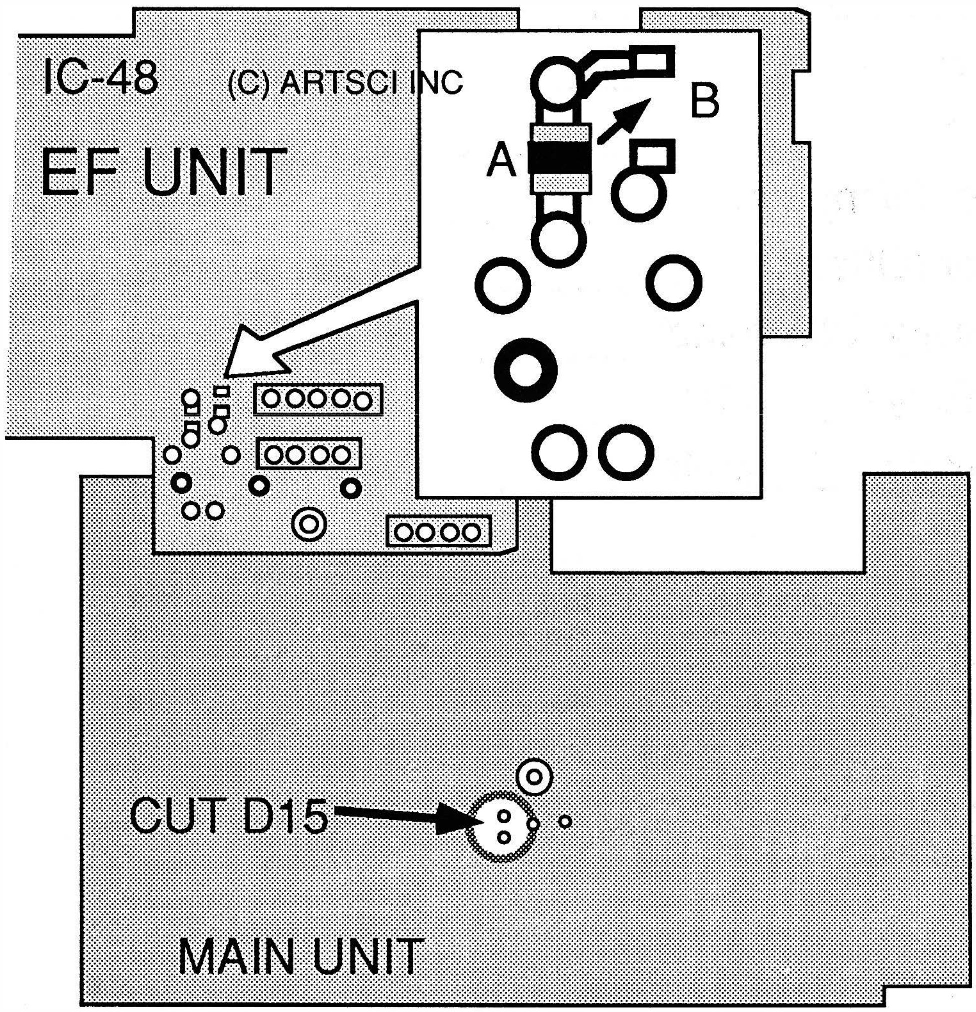




ICOM IC-48A

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case.
3. Locate R55 on EF unit.
4. Move R55 from A to B.
5. Locate and cut D15 on the main unit.
6. Reassemble the radio.

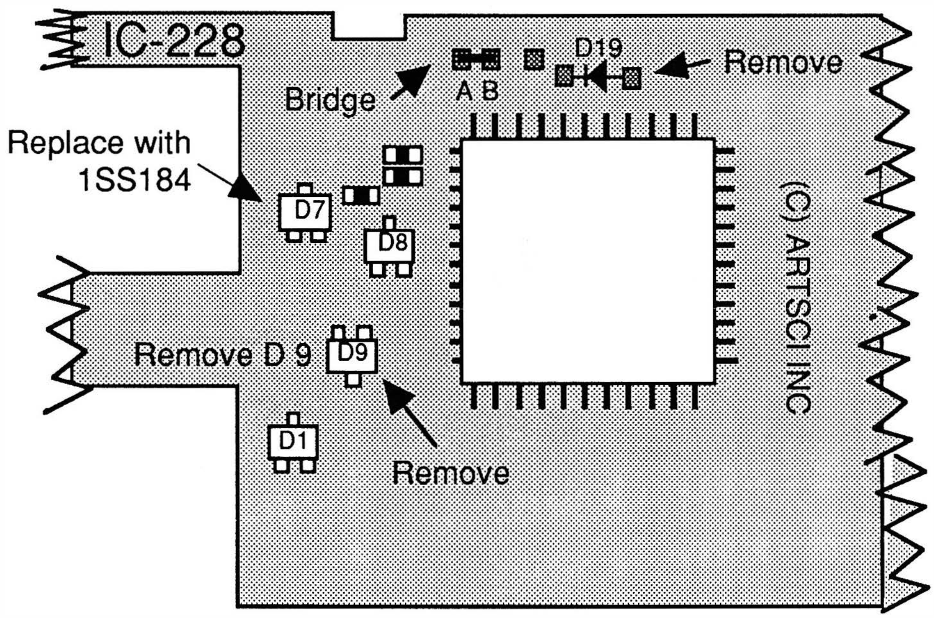




ICOM IC-228A

EXPANDED RF

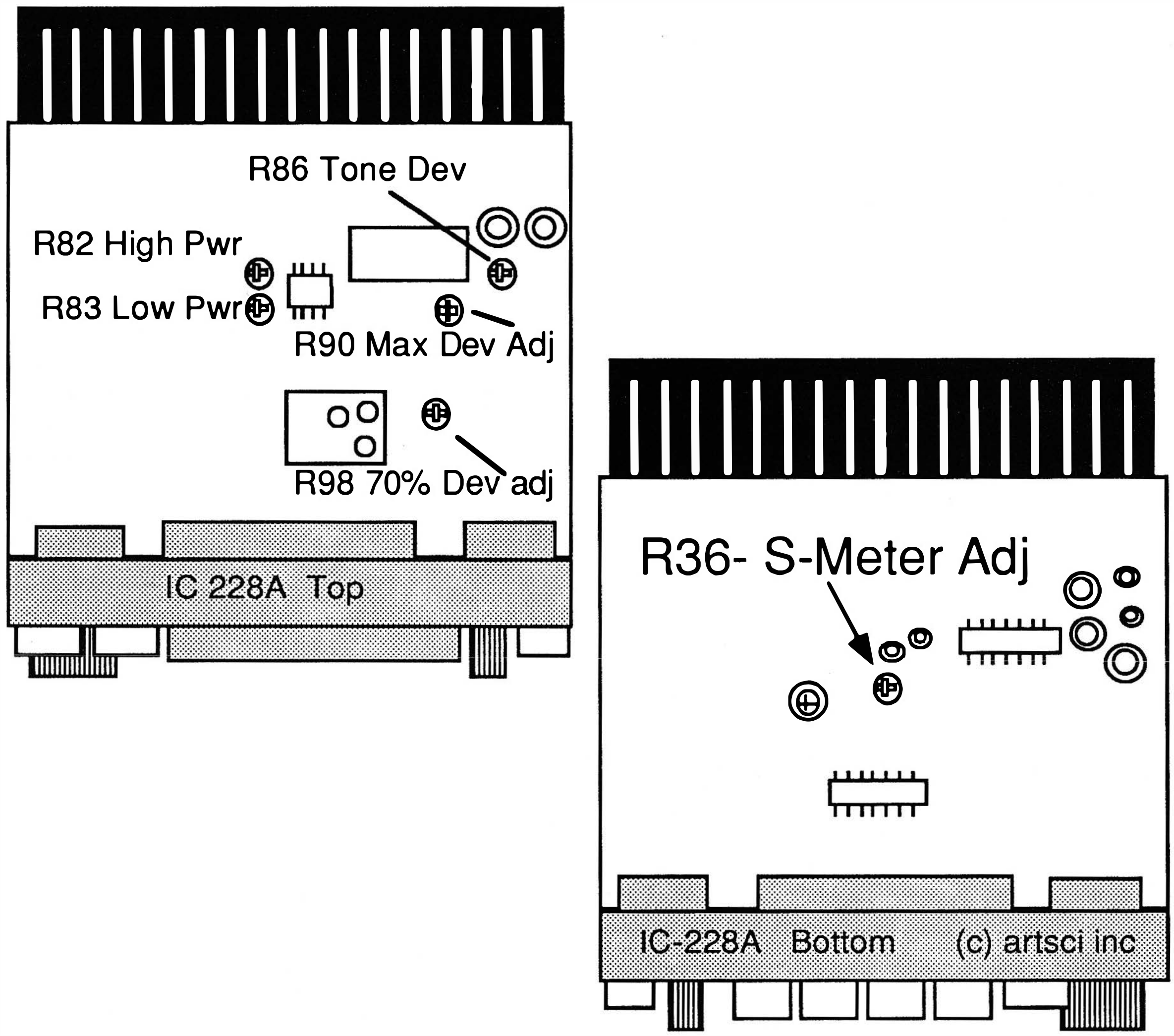
1. Remove power and antenna.
2. Remove screws open case of the EF Unit. (Control head).
3. Remove diode D19 (for all Serial Numbers)
4. Replace chip diode D7 with an 1SS184) (228A Below ser# 02900 & 228H below ser# 06300)
4. Remove chip diode D9 (228A above ser# 02900 & 228H above ser# 06300)
5. Solder bridge Pads A & B (228A above ser# 02900 & 228H above ser# 06300)
6. Reassemble the radio
7. Reset the microprocessor (Push and hold [SQUELCH/Monitor] & [LOCK] and turn power on)





ICOM IC-228A

Alignment Points



Note : Discriminator output on pin 9 of IC 1 (MC3357P)



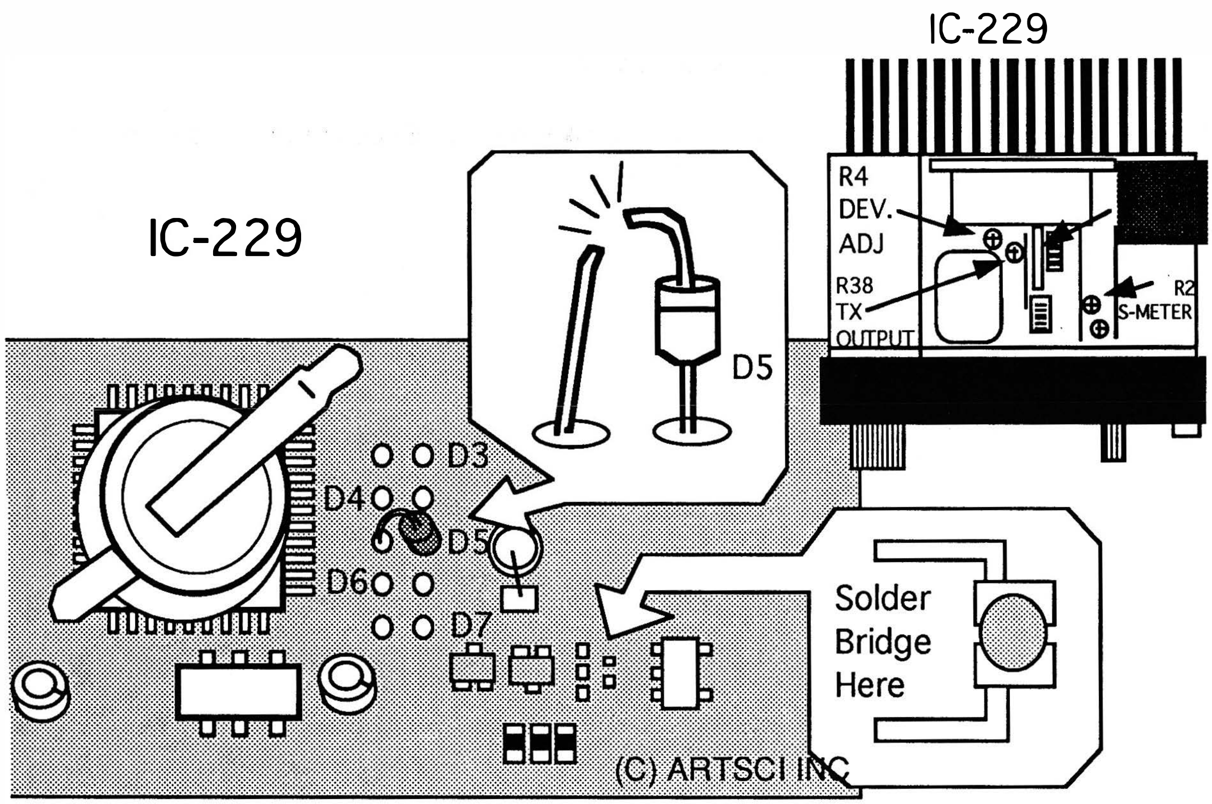
Caution

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ICOM IC-229

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case.
3. Locate and cut Diode D5 on the LOGIC board
4. Install a jumper at "land" point.
5. Reassemble the radio.
6. Reset the microprocessor. (Press and hold [SET] & [MW] and turn power on)



FREQ 118.000 - 135.995 MHz (AM) RX
136.000 - 174.000 MHz (FM) RX

136.000 - 174.000 MHz (FM) TX



Caution

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ICOM IC-290

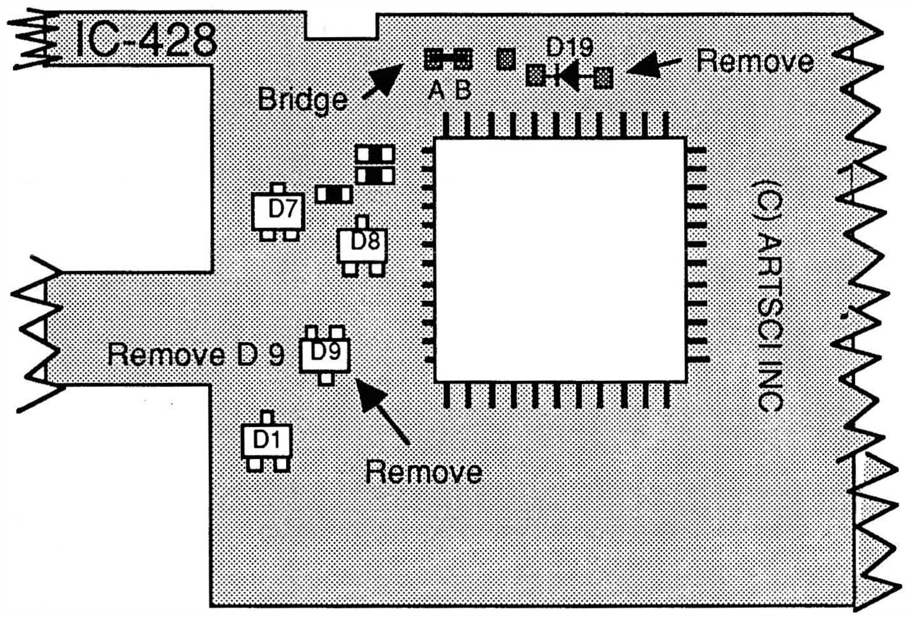
EXPANDED RF (Keyboard mod)

1. Set the offset to 0.0
2. Select "DUPLEX" mode (+ or -).
3. Select a VFO.
4. Press and hold the [WRITE] button.
5. Dial the desired frequency.
6. Release the [WRITE] button.
7. If desired, repeat the above steps for the other VFO.
8. Set offset back to 0.6
9. When changing frequency, remember to hold down the [WRITE] button or the display will revert back to within the normal band limits.

ICOM IC-448A

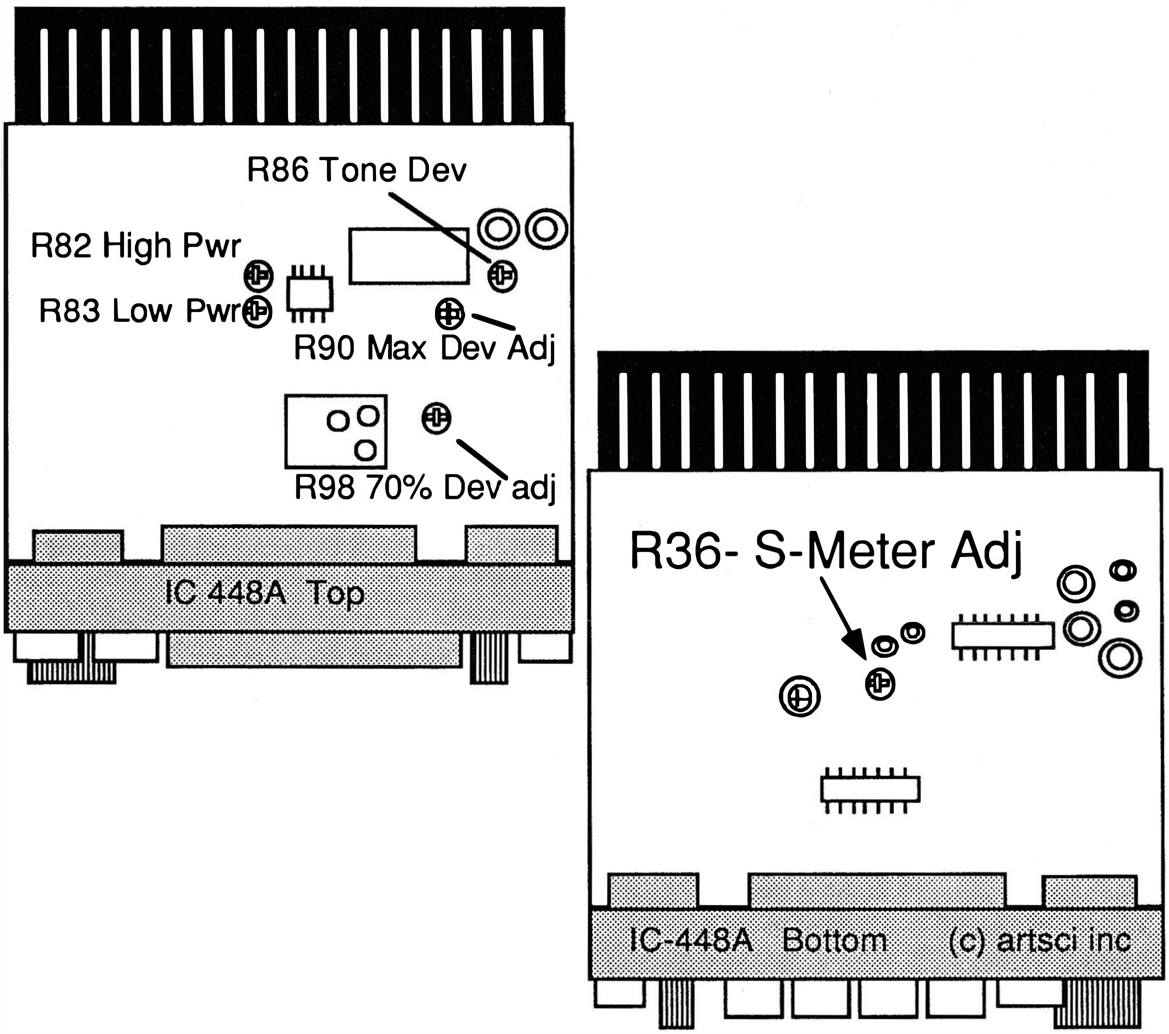
EXPANDED RF

1. Remove power and antenna.
2. Remove screws and open the case.
3. Remove diode D19
4. Remove chip diode D9
5. Solder bridge Pads A & B
6. Install Diode D7. (part # 1SS193)
7. Reassemble the radio.
8. Reset the microprocessor (Push and hold [SQUELCH/MONITOR] & [LOCK] and turn power on.



ICOM IC-448A

ALIGNMENT CONTROLS



Note : Discriminator output on pin 9 of IC 1 (MC3357P)

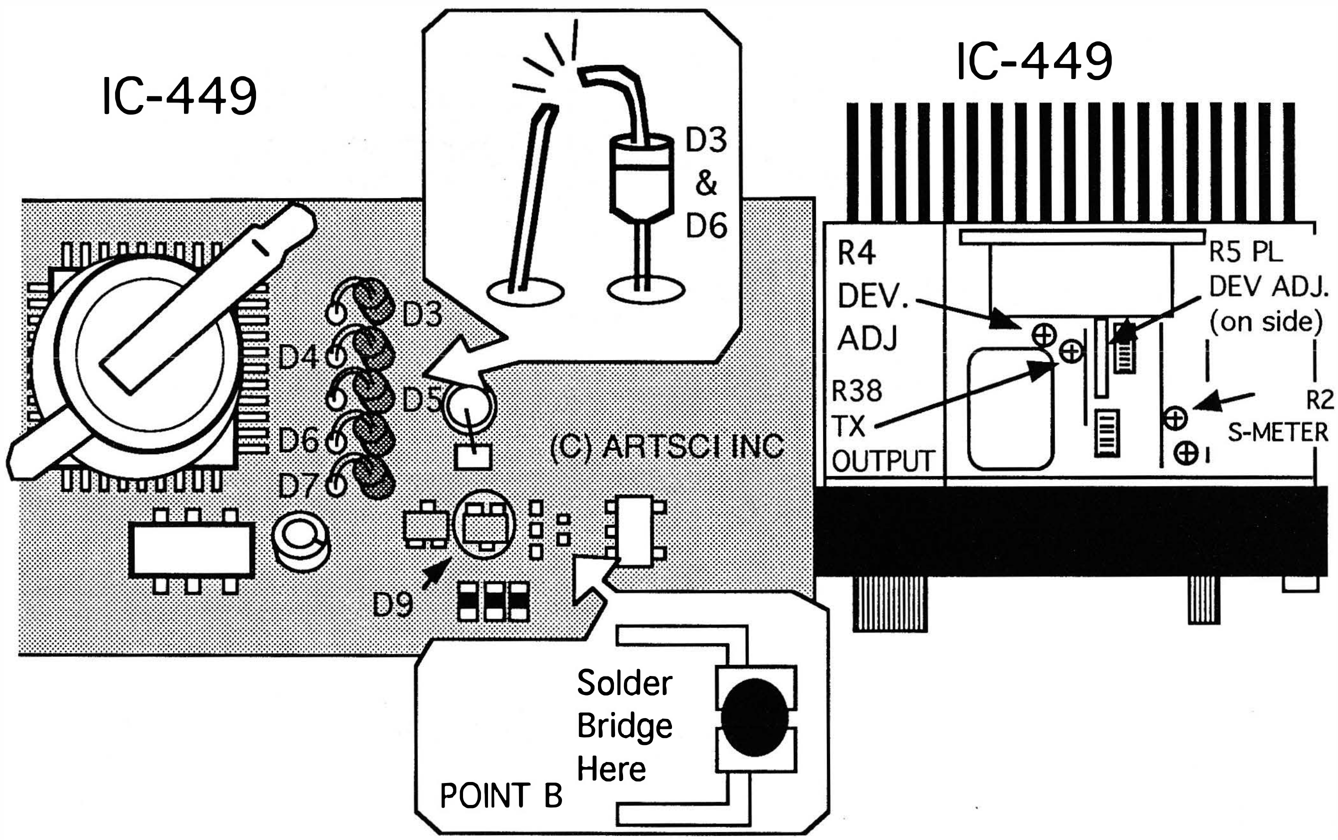


Caution

ICOM IC-449

EXPANDED RF/ ALIGNMENT CONTROLS

1. Remove power and antenna.
2. Remove screws and open the case.
3. Locate and short "point B".
4. Locate and cut diode D3.
5. Locate and cut diode D6.
6. Install diode D9 (1SS187).
7. Reassemble the radio.
8. Reset the microprocessor (Press and hold [SET] & [MW] and turn power on.





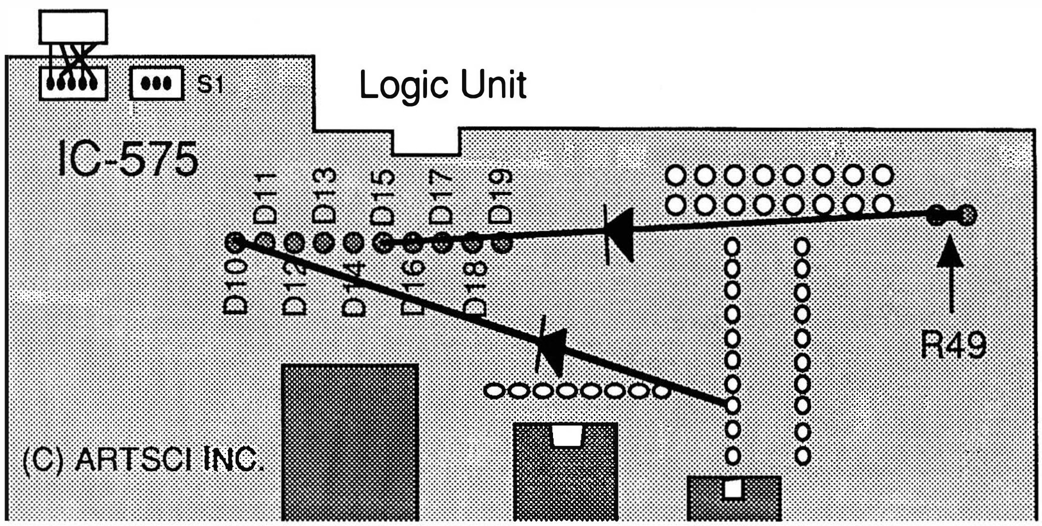
Caution

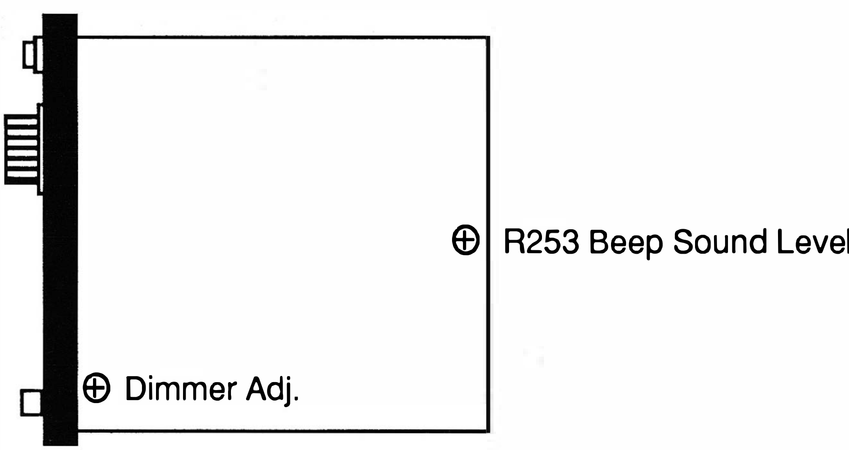
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ICOM IC-575

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case.
3. Locate the Logic Unit. It is located under the PA unit. (the PA unit has the speaker in it.) Follow the instruction used when installing the UT-34 Tone Squelch unit.
4. Attach two diodes as shown. (any standard diode)
   D10 to 3rd pin & R49 to D15
5. Reassemble the radio.
6. Reset the microprocessor (Press and hold [M-CL] and turn power on) .





Range	RX	26 - 56 MHz
	TX	26 - 56 MH

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ICOM IC-720A

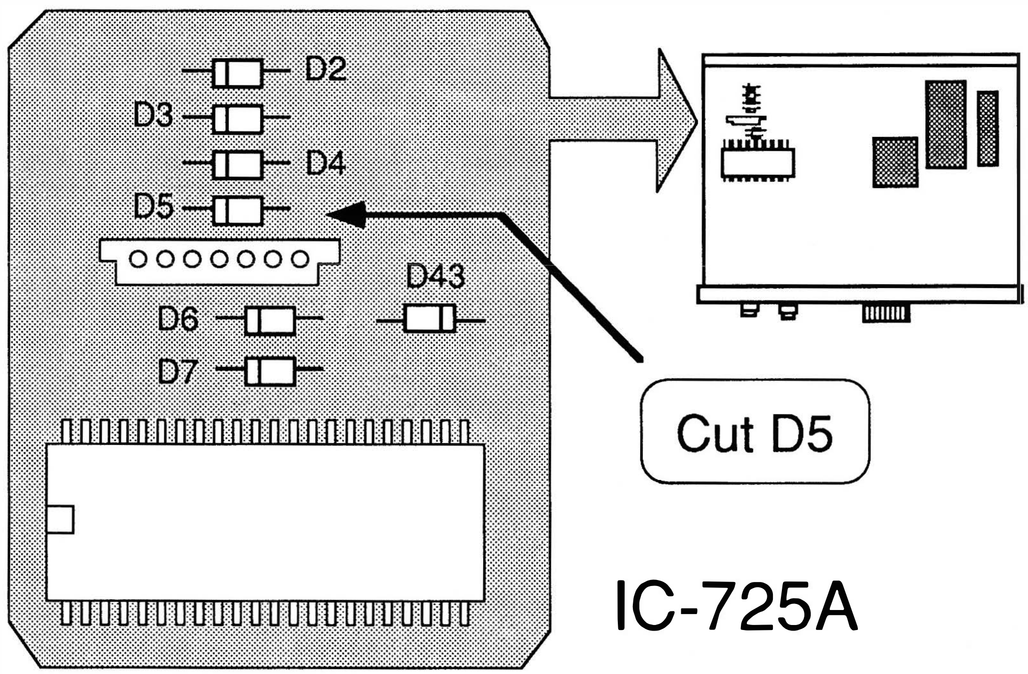
EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case.
3. Locate main board and cut light blue wire, pin 1 of plug K-10
4. Reset the Microprocessor.
5. Reassemble the radio.

ICOM IC-725A

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case.
3. Locate PLL board and cut diode D5.
4. Reset the microprocessor. (Hold [FUNCTION] & [MW] and turn power on)
5. Reassemble the radio.

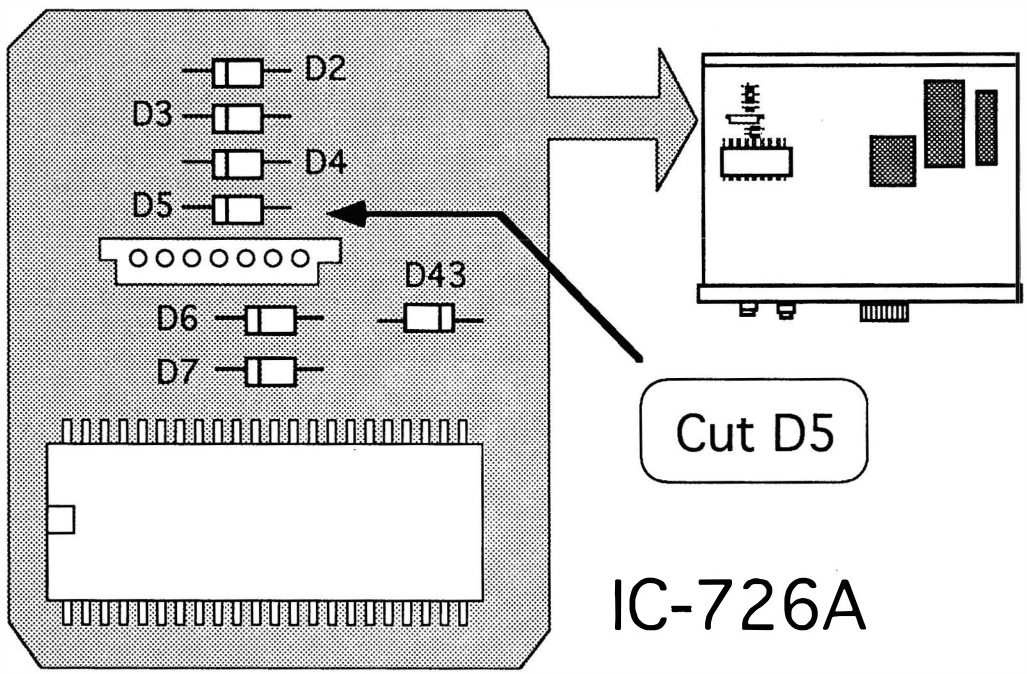



Caution

ICOM IC-726

EXPANDED RF

1. Remove power and antenna.
2. Remove top and bottom covers.
3. Locate PLL circuit board pictured below.
4. Cut Diode D5.
5. Reassemble the radio.
6. Reconnect the power.
7. Reset the microprocessor (Hold [FUNCTION] & [MW] and turn power on)





Caution

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ICOM IC-730

EXPANDED RF

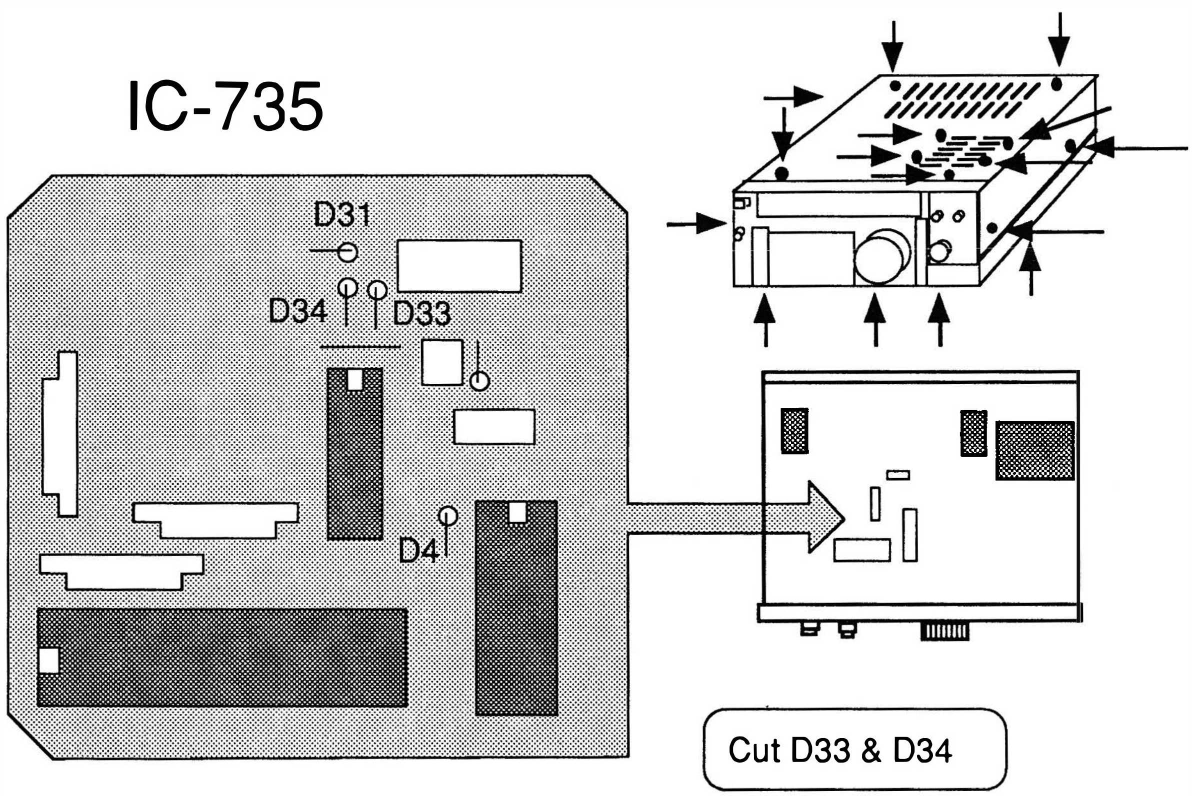
1. Remove power and antenna.
2. Remove screws open case.
3. Locate RF board.
4. Cut green wire(labeled 'D')
5. Cut resistor R-48
6. Reset the microprocessor.
7. Reassemble the radio

ICOM IC-735

EXPANDED RF

1. Remove power and antenna.
2. Remove screws and open top cover.
3. Remove screws and set PA unit aside.
4. Locate diodes D33 and D34 on the top of the PLL circuit board.
5. Cut the Teflon covered leads of Diodes D33 and D34.
6. Reassemble the radio.

Note: Accessing the main Board may require taking out many of the other components of the radio.





Caution

ICOM IC-740

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case.
3. Locate RF board.
4. Cut (white resistor) jumper located between D31 and 'C' wire.
5. Reset the microprocessor.
6. Reassemble the radio.

Caution

ICOM IC-745

EXPANDED RF

1. Remove Power and Antenna.
2. Remove screws open case.
3. Locate RF board on the side of the radio.
4. Cut the light brown wire on J7 Pin 1.
5. Reassemble the radio.

ICOM IC-751

EXPANDED RF

OLDER VERSION

1. Remove Power and Antenna.
2. Remove screws open case.
3. Locate RF board on the side of the radio.
4. Cut the black wire on J2 Pin 1.
5. Reassemble the radio.

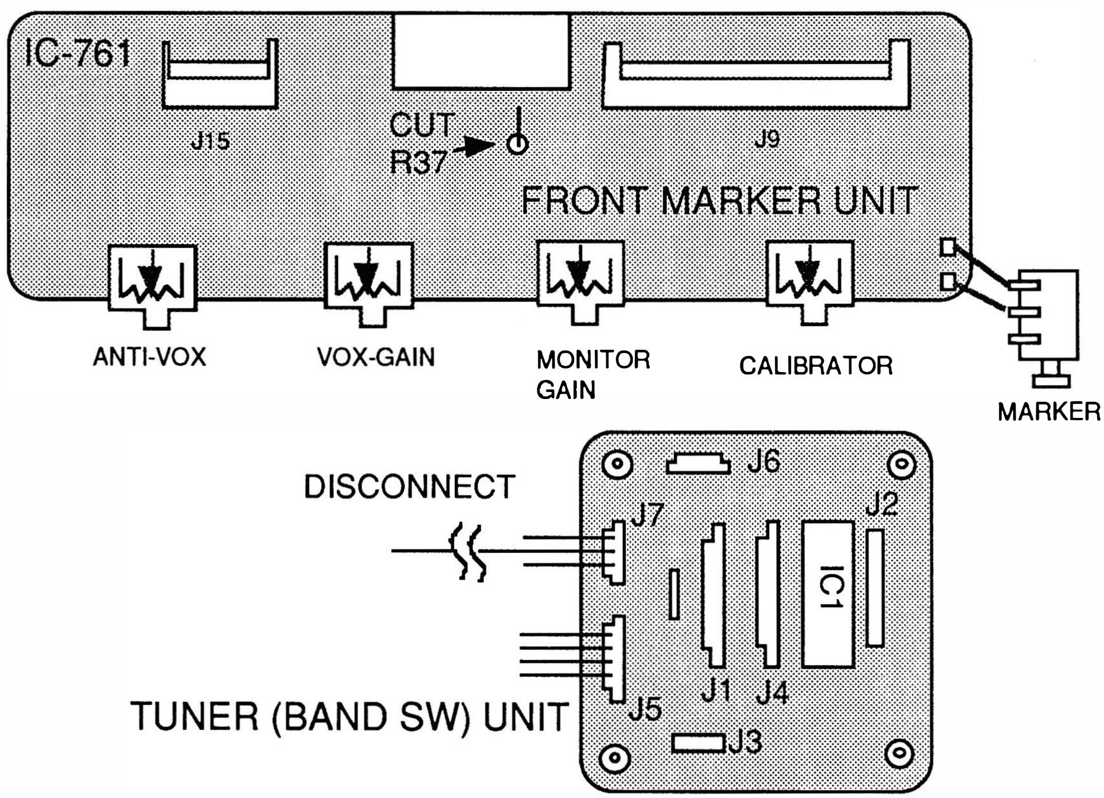
NEW VERSION IC-751A

1. Remove Power and Antenna.
2. Remove screws open case.
3. Locate noise blanker board. (Near front panel)
4. Locate and cut resistor R34.
5. Reassemble the radio.

ICOM IC-761

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case (top and bottom covers).
3. Locate front (Marker) Unit. (Behind the monitor gain controls)
4. Locate and cut Resistor R37.
5. Position radio normal side up and locate the Tuner band switch unit. (Located on top of the tuner unit and behind the keyer unit)
6. Disconnect the mute line (Middle wire) from the connector J407. (J407 is pluged into connector J7 on the Tuner band unit)
7. Reassemble the radio.
8. Reset the microprocessor. (Hold [M-CLEAR] and turn power on)

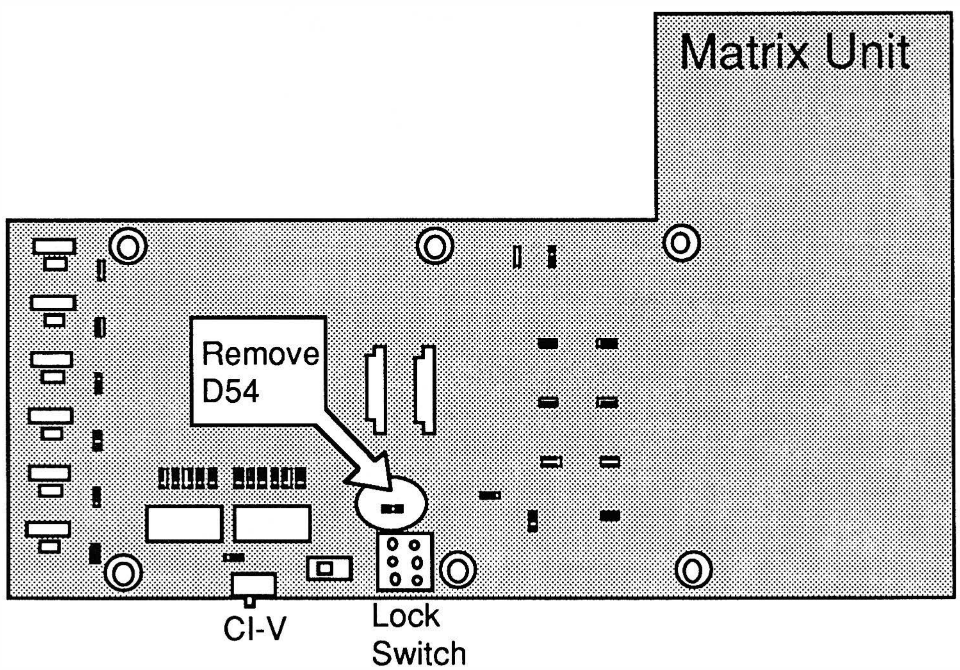


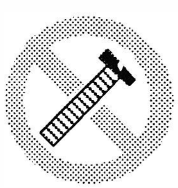


ICOM IC-765

EXPANDED RF

1. Remove power and antenna.
2. Remove screws and open bottom cover.
3. Locate and remove diode D54.
   Note: (It is located on the "L" shaped board mounted vertically).
   (Positioned just above the "LOCK" switch)
4. Reassemble the radio.
5. Reset the microprocessor. (Hold [M-CLEAR] and turn power on)



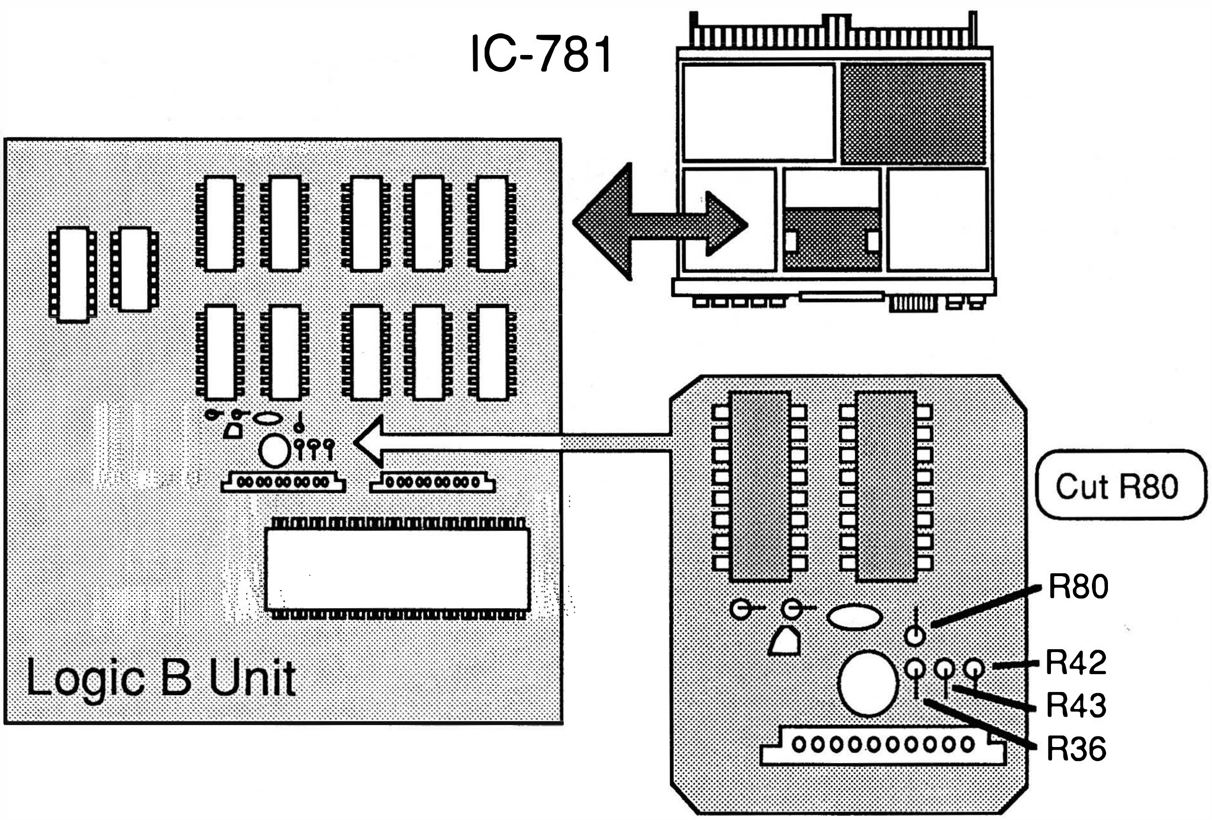


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ICOM IC-781

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open case.
3. Locate and cut resistor R80 on Logic B unit.
4. Reset the microprocessor.
5. Reassemble the radio
6. Reset the microprocessor. (Hold [M-CLEAR] and turn power on)



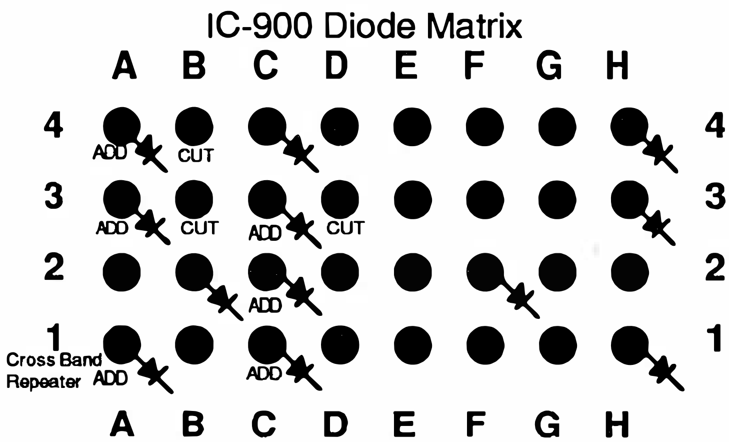


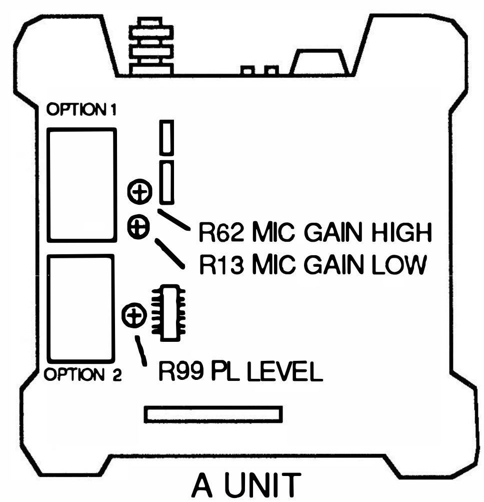
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ICOM IC-900

EXPANDED RF / CROSS BAND REPEATER

1. Open Control Head
2. Locate Diode Matrix on Display B board of Control Head.
3. Add and remove Diodes according to drawing
4. Reassemble control Head.
5. Open Interface A unit.
6. Change the switch position from "1" (factory) to "2" on interface A board (below the tone units).
7. Reassemble Interface A.
8. Reset the microprocessor. (Press and hold [MR] and turn power off and back on)





CROSS BAND REPEATER PROCEDURES (Simplex Freqs only)

TURN ON - Turn LOCK switch ON.

TURN OFF - Turn LOCK switch OFF.



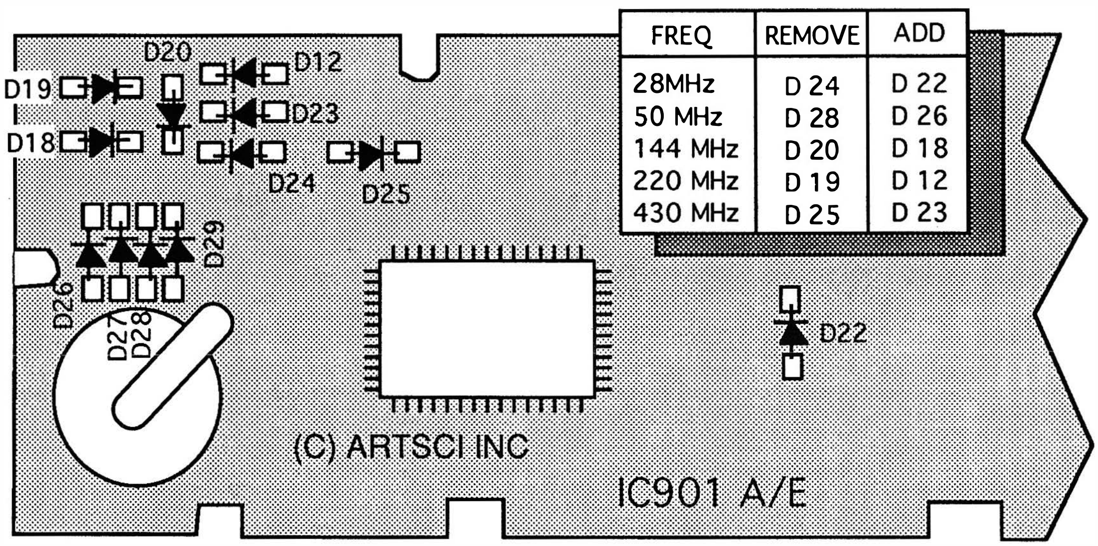
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ICOM IC-901A

EXPANDED RF - CROSS BAND REPEATER

1. Remove control head Cable.
2. Remove screws and open case.
3. Located and remove diodes D24, D28, D20, D19 and D25.
4. Attach diodes D22, D26, D18 D12, D23.
5. Remove Diode D27 (Cross band repeater mod).
6. Reassemble control head.
7. Reset the microprocessor (Turn radio on and press [CHECK] & [MW].



FREQ	REMOVE	ADD
28MHz	D 24	D 22
50 MHz	D 28	D 26
144 MHz	D 20	D 18
220 MHz	D 19	D 12
430 MHz	D 25	D 23

Mic Gain Adjustment: Adjust R70 in the Logic A Unit.

TO ACTIVATE CROSS BAND REPEATER MODE:

1. Turn the power off.
2. Push and hold [CHECK] and [LOCK] and turn power on.

TO DEACTIVATE CROSS BAND REPEATER MODE:

1. PRESS [LOCK] BUTTON.

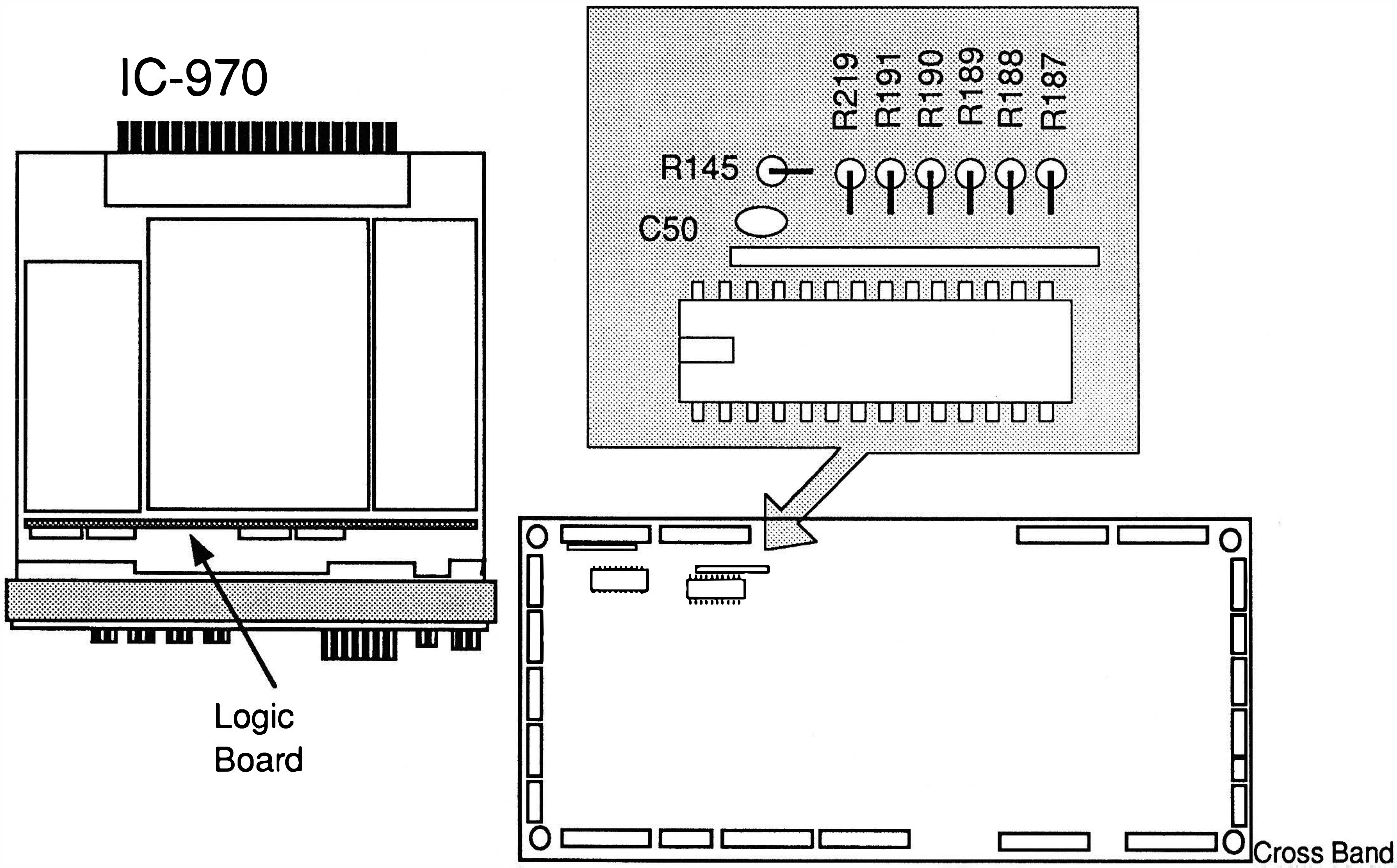


Caution

ICOM IC-970

EXPANDED RF

1. Remove power and antenna.
2. Remove top and bottom covers.
3. Locate and expose the logic board. (see drawing)
4. Locate and cut resistor R187.
5. Locate and cut resistor R190.
6. Locate and cut resistor R219.
7. Locate and cut resistor R191. (XBand Repeater Mod)
8. Locate resistor position R 188 and add a 10K ohm resistor.
9. Reassemble the radio.
10. Reset the microprocessor. (Push and hold [MW] and turn power on).



Proceedure:
1) Set the MAIN & SUB Frequencies.
2) Turn Radio off.
3) Press [LOCK] switch ON.
4) Press and hold [FUNCTION] & [M/S] switch and turn on.
5) TO CANCEL REPEATER FUNCTGION - Turn the [LOCK] switch off.



Caution

Performance Report

Radio ______________________________ Date ______________

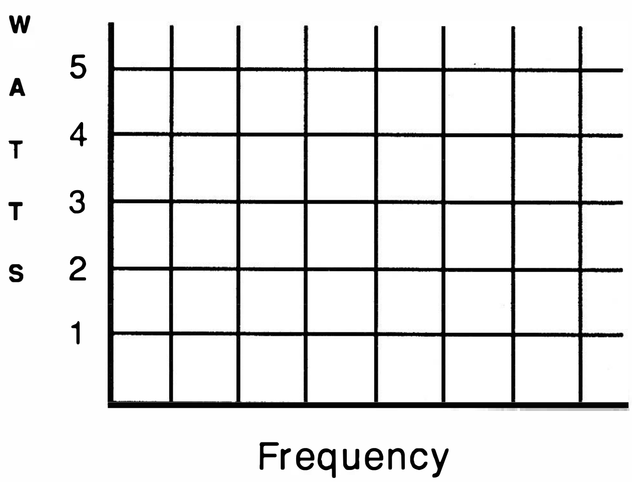
Owner : Name ____

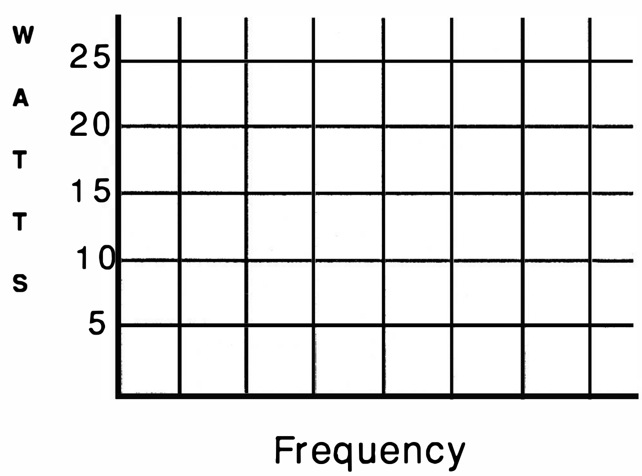
Address ______________________________________

City ____________________ St. ______ Zip __________

Phone ( ) - ____________________________________

Description	Before	After
Power out (Low)	________ Watts	________ Watts
Power out (High)	________ Watts	________ Watts
Frequency Error (Simplex)	________ Hz	________ Hz
Frequency Error (Offset)	________ Hz	________ Hz
Receive Sensitivity (Mid-band)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
PL Deviation	________ Hz	________ Hz
DTMF Deviation	________ KHz	________ KHz
Audio Deviation	________ KHz	________ KHz
Lowest usable Freq @ .5 Pwr	________ MHz	________ MHz
Highest usable Freq @ .5 Pwr	________ MHz	________ MHz

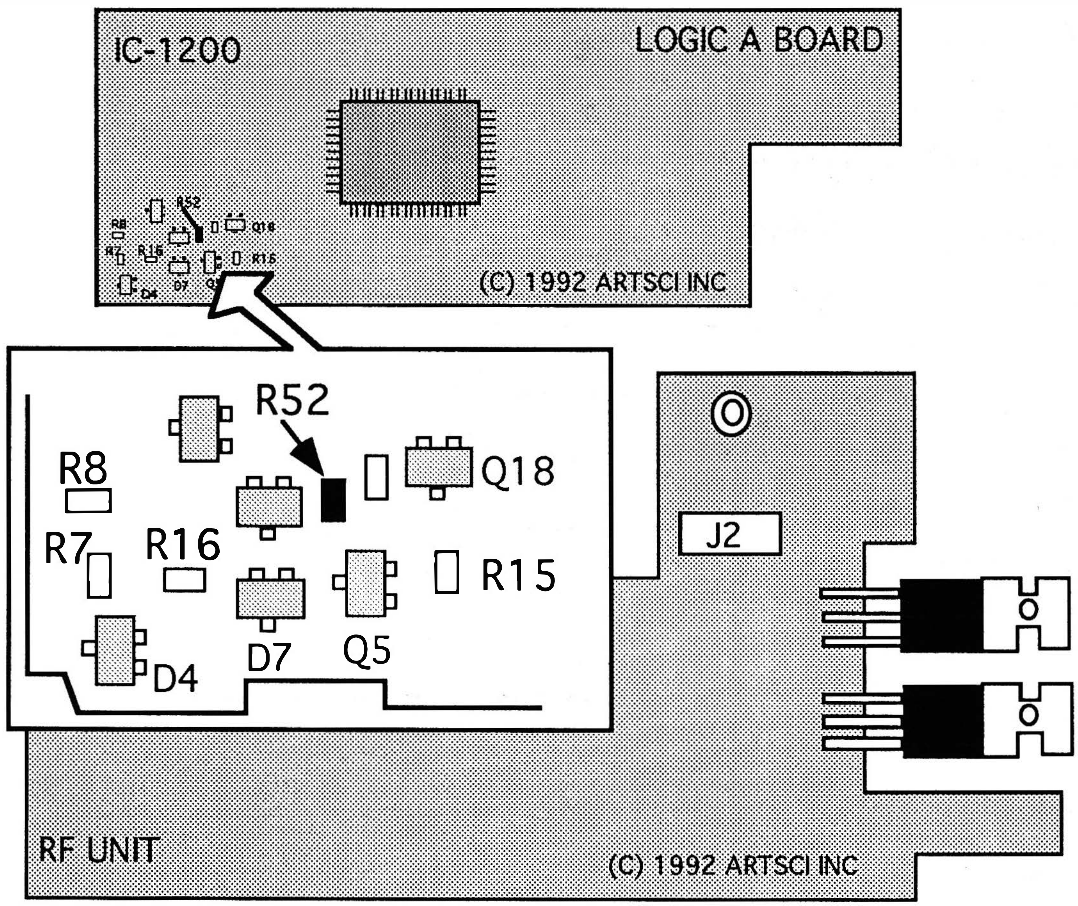




ICOM IC-1200

EXPANDED RF 870-960 MHz

1. Remove Power and Antenna.
2. Remove screws open case.
3. Locate and cut Resistor R52 on Logic A unit.
4. Install a new antenna connector to position J2 on RF board.
   Note: a different antenna is required for the 870-960 bands
5. Reassemble the radio.
6. Reset the microprocessor.
   (Hold down the tuning control and turn the power on)
   or
   (Insert a toothpick in hole in the corner of the bottom cover.)

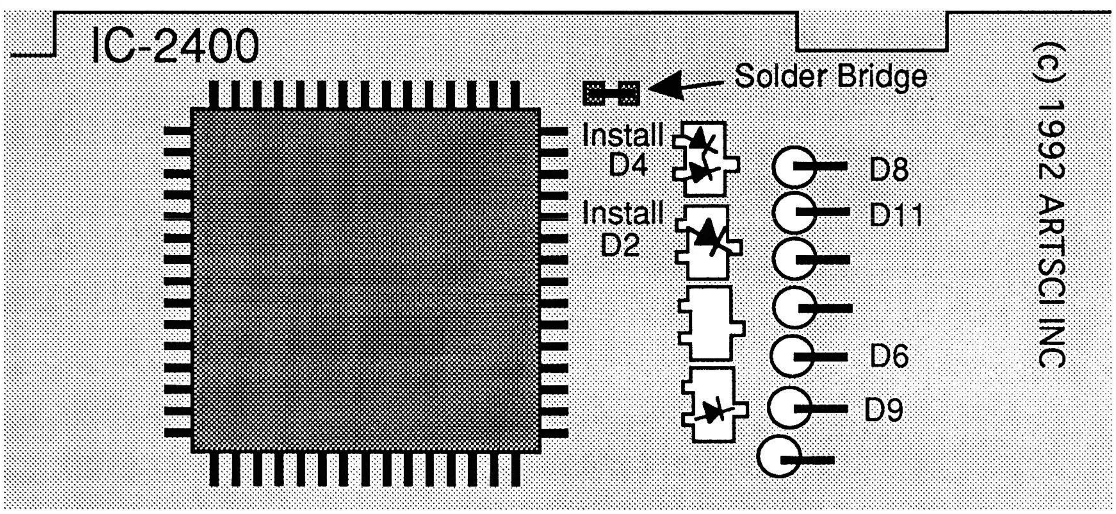



Caution

ICOM IC-2400

EXPANDED RF / CROSS BAND REPEATER

1. Remove battery and antenna.
2. Remove screws open case.
3. Locate and cut diode D5. (440 Mod)
4. Locate and cut diode D6.(440 Mod)
5. Install chip diode . (see drawing)(440 Mod)
6. Locate and cut diode D11. (2 Meter mod)
7. Locate and cut diode D8. (2 Meter mod)
8. Install chip diode. D4 (1SS184 B3)
9. Install chip diode. D2 (1SS193 F3)
10. Solder jump pads.
11. Locate and cut D9. (Repeater Mod)
12. Reassemble the radio.
13. Reset the microprocessor. (Press and hold [SUB VOL] & [MW] and turn power on)



CROSS BAND REPEATER PROCEDURES

TURN ON - Push and hold [SET], [MONI] & [MHZ] & Mic down Button and turn power on.

TURN OFF - Push and hold [SET] then press [MHZ]

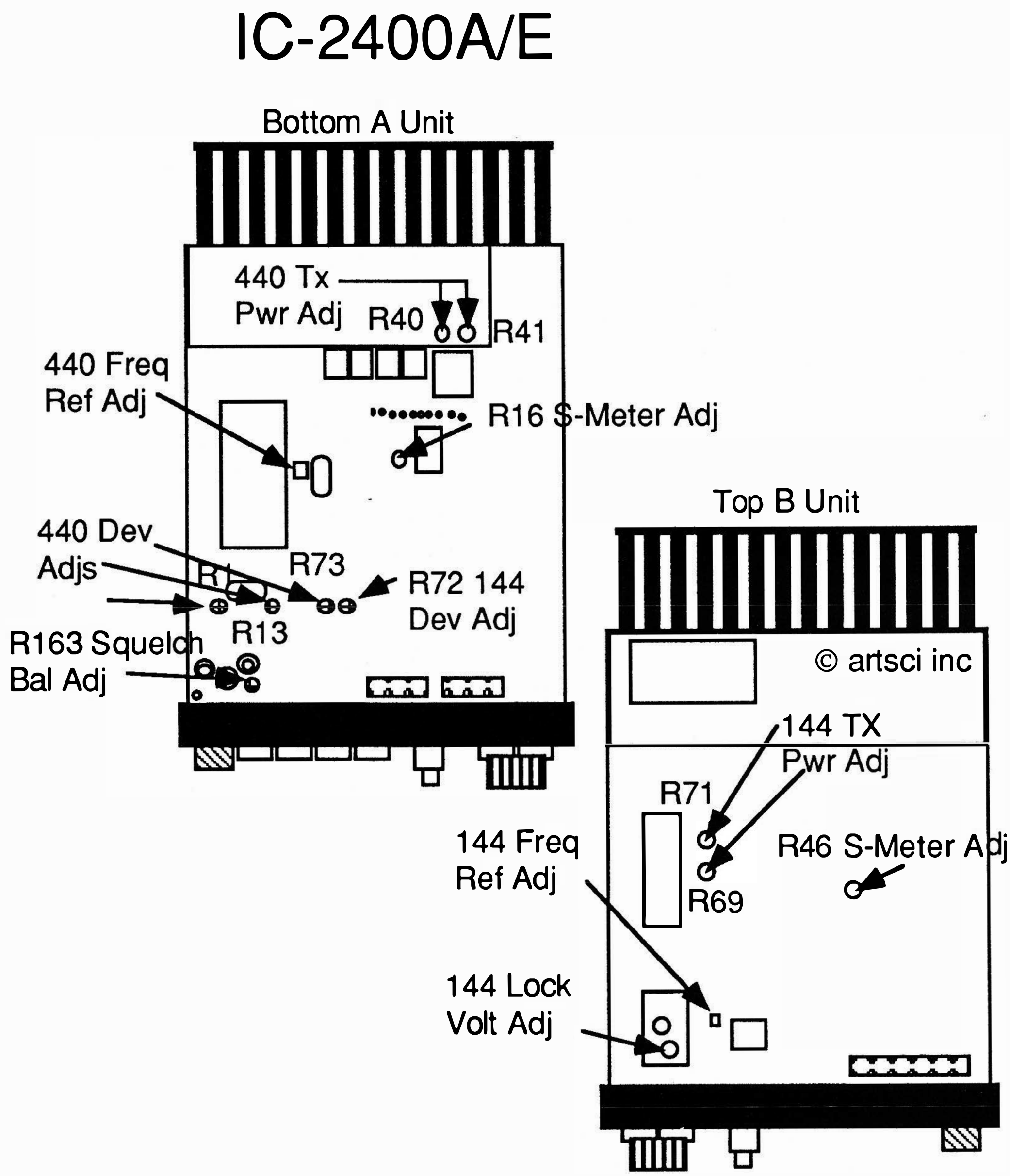
MORE ----



Caution

ICOM IC-2400

ALIGNMENT POINTS



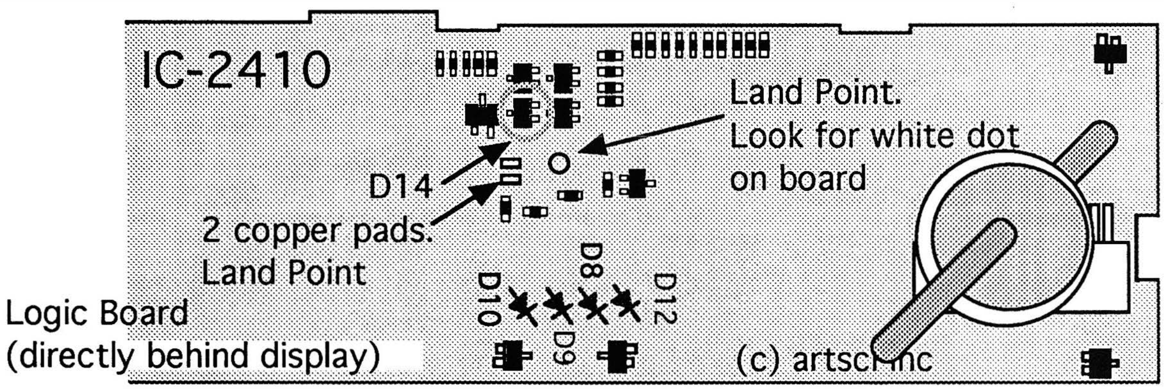


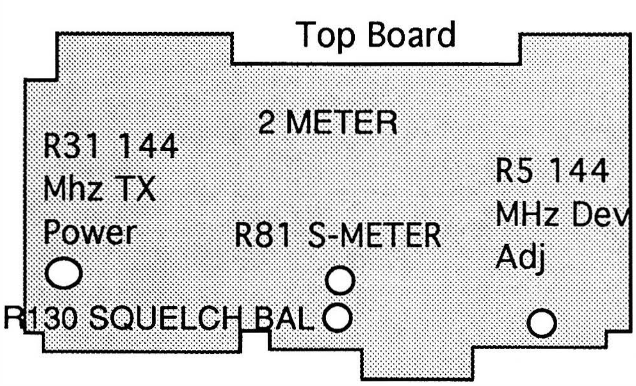
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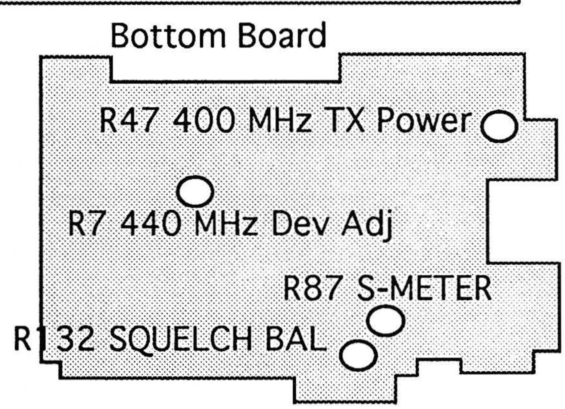
ICOM IC-2410

EXPANDED RF

1. Remove power and antenna.
2. Remove screws open top and bottom case. (two on each top and 4 on each side)
3. Remove the 4 screws in the metal frame holding the front panel and pull the front face away from the radio.
4. Locate and cut diode D9 on logic board. (VHF Rx mod 118 - 136 MHz)
5. Locate and cut diode D10. (UHF R Mod 440 - 479 MHz)
6. Locate and cut diode D8. (320-399 MHz & 830-950 Rx Mod)
   Note: An antenna cable is required for 830-950 MHz range. Use Jack J2 on main board B to connect an antenna cable.
7. Locate and solder jump 'LAND' point (two copper pads) on logic board. (VHF Tx mod)
8. Locate diode D14 on logic board.
9. Replace D14 with a 1SS181 diode. (UHF Tx mod)
10. Install a type "N" coax pigtail (Icom part OPC-166) to Connector J2 on 900 MHz IF strip. You will need a 5 3/4" gray coax jumper.
    (Be sure to route the Pigtail through the antenna connectors in the rear panel).
14. Reassemble the radio.









Caution

ICOM IC-2410

SPECIAL FUNCTIONS

MINI REPEATER FUNCTION.

ACTIVATION

1. Set VHF & UHF Frequency. Offset and tone can be programmed in.
2. Press and Hold [BAND] & [SET] switch.
   The Memory number indicator will blink an "L" symbol.

NOTE: The microphone PTT wil operational. Use the [UP] & [DOWN] keys to elect the transmitting band. A flashing decimal point will appear on the selected band.

CANCELLATION

1. Press and hold the [SET] button until the the memory "number" display appears.

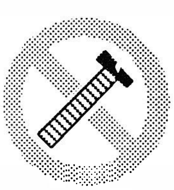
VOICE ANSWER BACK FUNCTION (Optional UT-66 & UT-55 are required)

1. Switch on the SUB BAND remote mode. (see user manual)
2. Send remote control code "D" & "C" . (Control is on the sub band frequency)
   The operating frequency of the main band will be announced.

SPECIAL COMMANDS

ENTER REMOTE DTMF MODE	Send "B" PASSWORD "#" Default is B000#
EXIT DTMF REMOTE MODE	Send "B" PASSWORD "*" Default is B000*
XBAND REPEATER ON	Press [BAND] & [SET] until flashing "L" appears
XBAND REPEATER OFF	Press [SET] until memory # appears.
REMOTE XBAND ON	Send "D" "B" "*" on remote DTMF keypad.
REMOTE XBAND OFF	Send "B" "PASSWORD" "#" Default is B000#
REMOTE VOICE READBACK	Send "D" "C" on remote DTMF keypad.

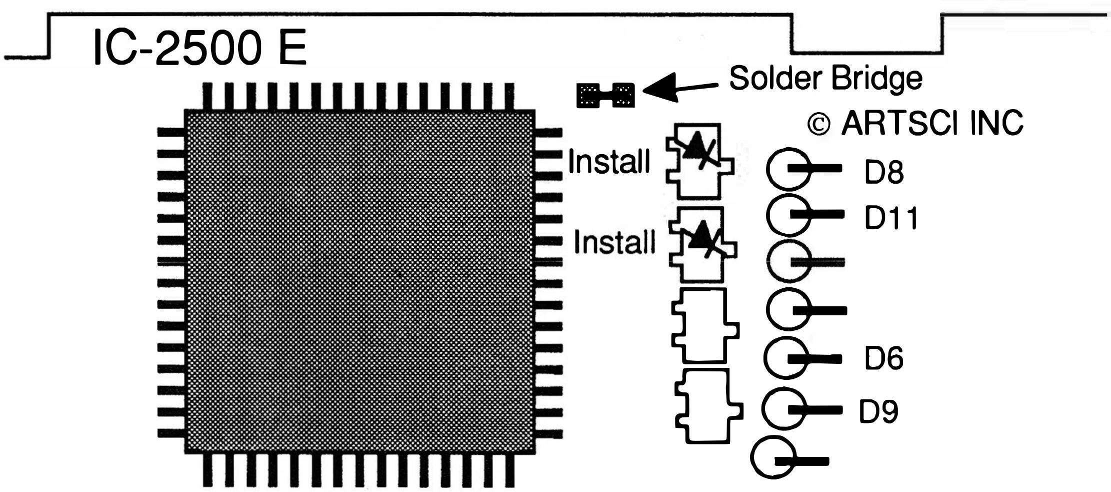
XBAND function must be off to control all transceiver functions.


Caution

ICOM IC-2500

EXPANDED RF / CROSS BAND REPEATER

1. Remove battery and antenna.
2. Remove screws open case.
3. Locate and cut diode D11. (440 Mod)
4. Locate and cut diode D 6.(440 Mod)
5. Install chip diode . (see drawing)(440 Mod)
6. Locate and cut diode D11
7. Locate and cut diode D8
8. Install chip diode. (see drawing)
9. Solder jump pads.
10. Locate and cut D 9 (Repeater mod)
11. Reassemble the radio.
12. Reset the microprocessor. (Press and hold [SUB VOL] & [MW] and turn power on)



CROSS BAND REPEATER PROCEDURES

TURN ON - Push and hold [SET], [MONI] & [CALL] & Mic down Button and turn power on.

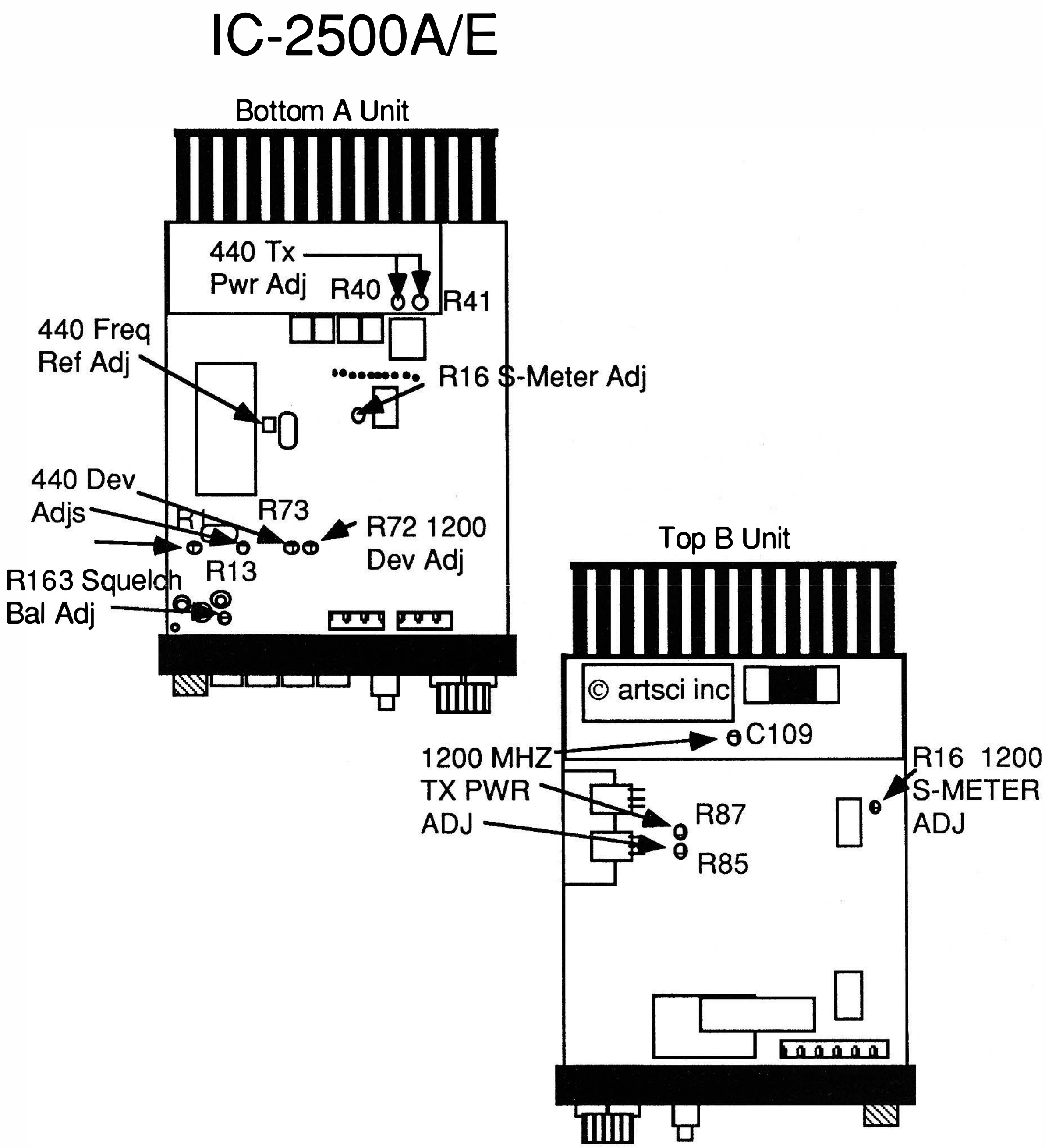
TURN OFF - Push and hold [SET] then press [MHZ]

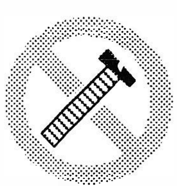
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ICOM IC-2500

ALIGNMENT POINTS

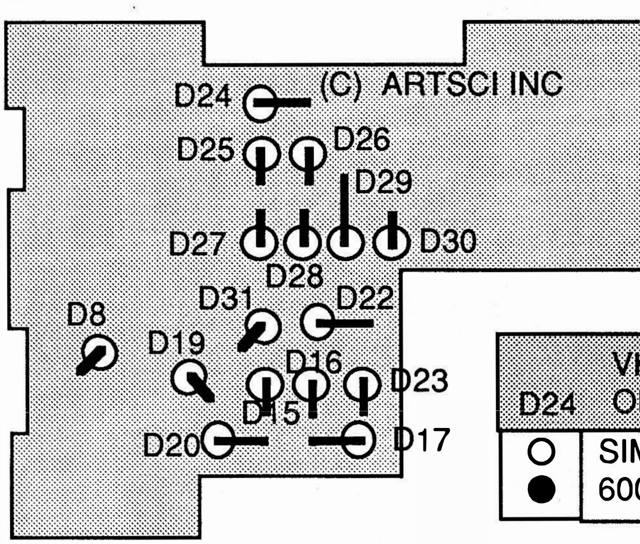




ICOM IC-3200

EXPANDED RF

1. Remove battery and antenna.
2. Remove screws open case.
3. Locate Diode programming matrix (Control Head).
4. Install or remove diodes using tables below.
5. Reassemble the radio.
6. Reset the microprocessor.



D15	D16	D17	RANGE
○	○	○	144 - 154
●	○	○	144 - 146
○	●	○	140 - 148
●	●	○	140 - 150
○	○	●	144 - 156
●	○	●	140 - 154
○	●	●	140 - 150

D24	VHF OFFSET
○	SIMPLEX
●	600 KHZ

D19	D20	D18	RANGE
○	○	○	430 - 440
●	○	○	432 - 437
○	●	○	430 - 440
●	●	○	430 - 440
○	○	●	440 - 450

D27	D28	UHF OFFSET
○	○	SIMPLEX
●	○	0 MHZ
○	●	5 MHZ
●	●	7.6 MHZ

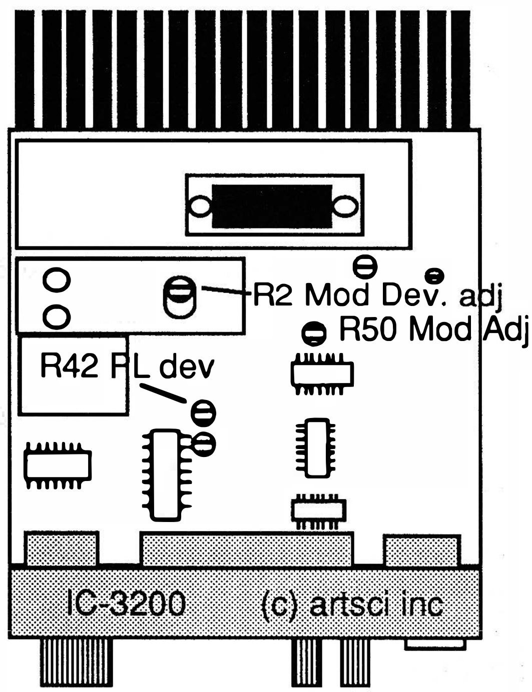
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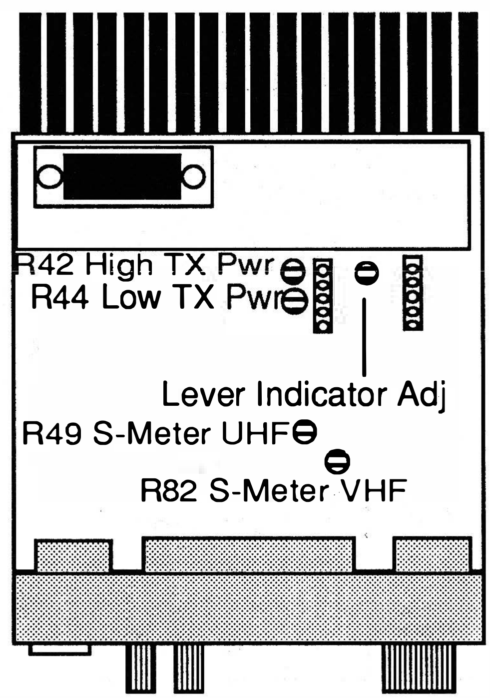

Caution

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ICOM IC-3200

Alignment Controls



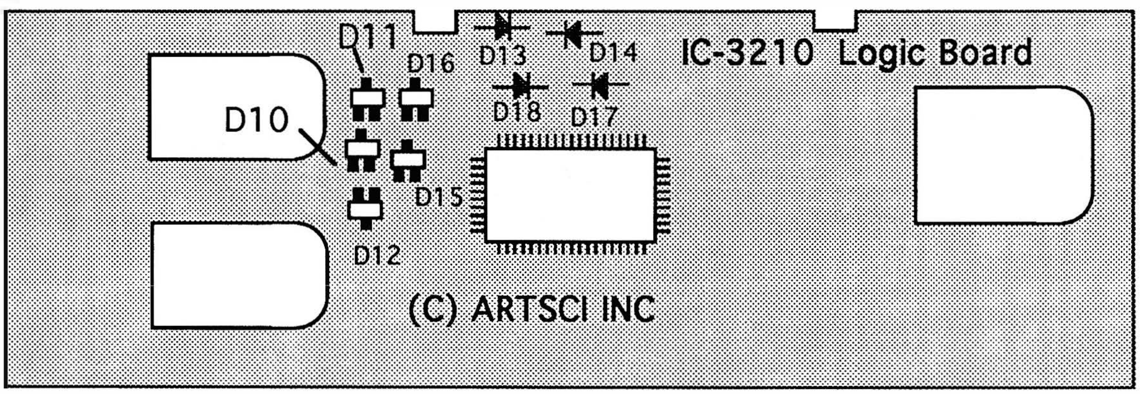


Caution

ICOM IC-3210

EXPANDED RF / CROSS BAND REPEATER

1. Remove battery and antenna.
2. Remove screws open case.
3. Locate and cut diode D17. (Already removed in USA version) (144 mod)
4. Replace chip diode D10 in position A. (New: 1SS184 B3) (144 mod)
5. Locate and cut diode D18. (440 mod)
6. Replace chip diode D11 in position B (old: 1SS196 New: 1SS184 (B3))(440 mod)
7. Locate and cut diode D14. (Repeater mod)
8. Reassemble the radio
9. Reset the microprocessor. (Push and hold [SQUELCH/Monitor] & [LOCK] and turn power on)



CROSS BAND REPEATER PROCEDURES

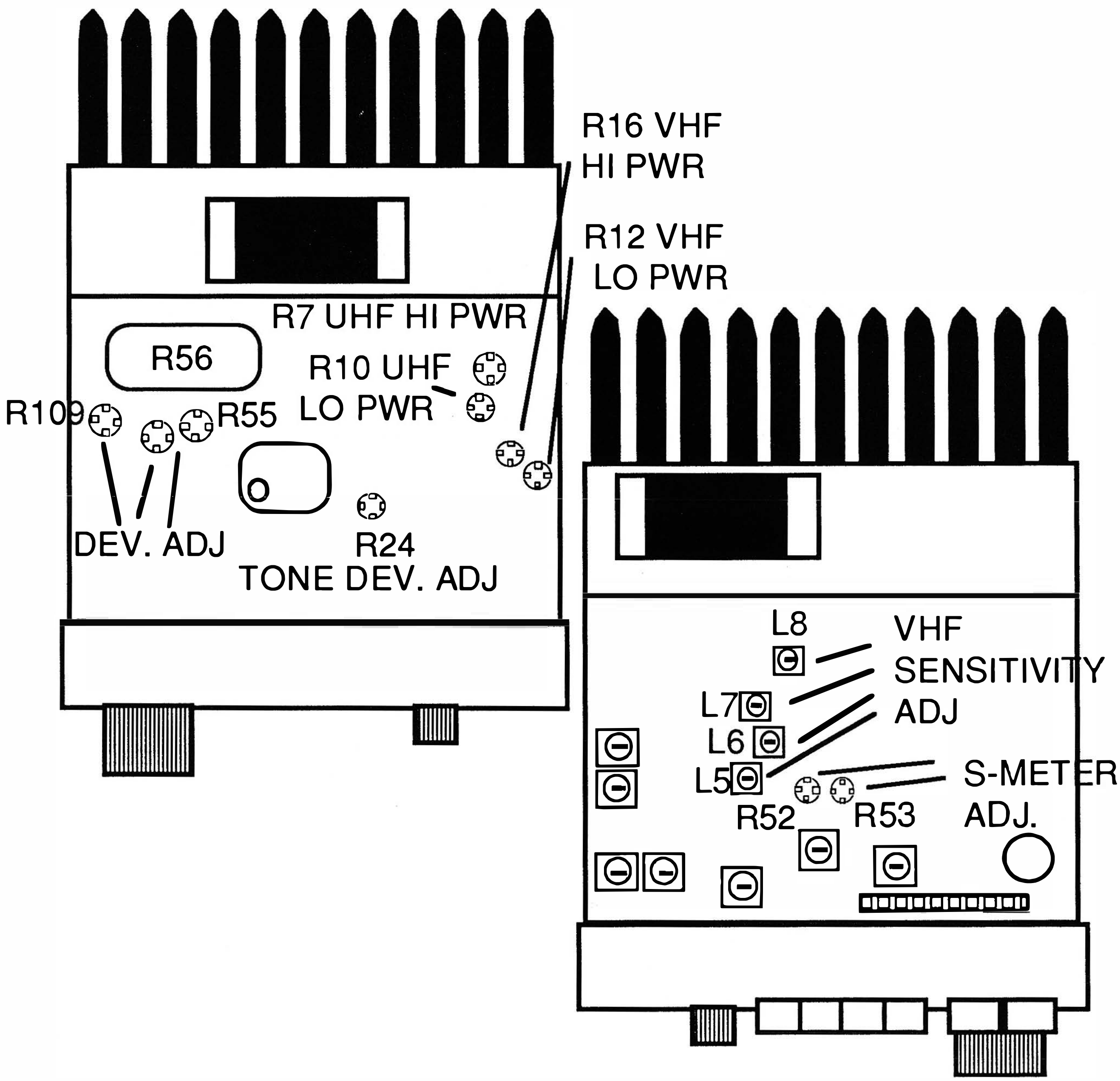
TURN ON - Set radio to "SPT mode". Push and hold "Band switch & "Lock switch" ("SPT" and "L" will flash)

TURN OFF - Press [LOCK] switch.

MORE ---

ICOM IC-3210

ALIGNMENT CONTROLS

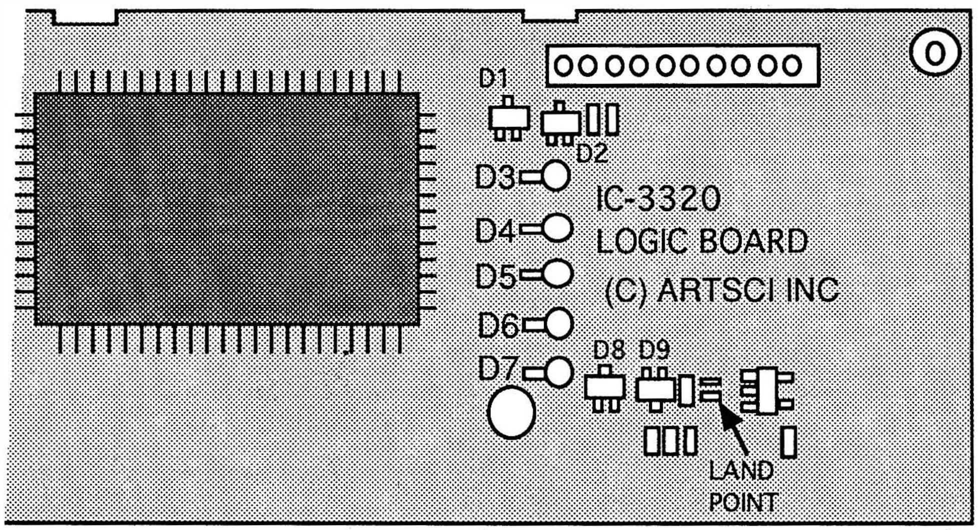




ICOM IC-3220

EXPANDED RF & Air Craft AM

1. Remove power and antenna.
2. Remove screws open case.
3. Locate and Cut Diode D4 on the LOGIC board. (VHF 118 -135 Mhz)
4. Locate and Cut Diode D5 on the LOGIC board. (UHF)
5. Install a jumper at "land" point. (VHF) Located right of D9.
6. Install a diode (1SS181) at Location D9 on the LOGIC board.
7. Reassemble the radio
8. Reset the microprocessor. (Press and hold [SET] & [MW] and turn radio on)



FREQ 118.000 - 135.995 MHz (AM) RX 136.000 - 174.000 MHz (FM) RX
136.000 - 174.000 MHz (FM) TX 440.000 - 479.000 MHz (FM) RX & TX

CROSS BAND REPEATER PROCEDURES

TURN ON - Set VHF & UHF Frequencies in DUAL WATCH mode.
Press and hold [BAND] and press [SET]. Memory channel will show a flashing "L"

TURN OFF - Press [SET] key. Turning off the radio will not disable repeater mode.

Note: The Mic PTT will still operate the radio in repeater mode!!!

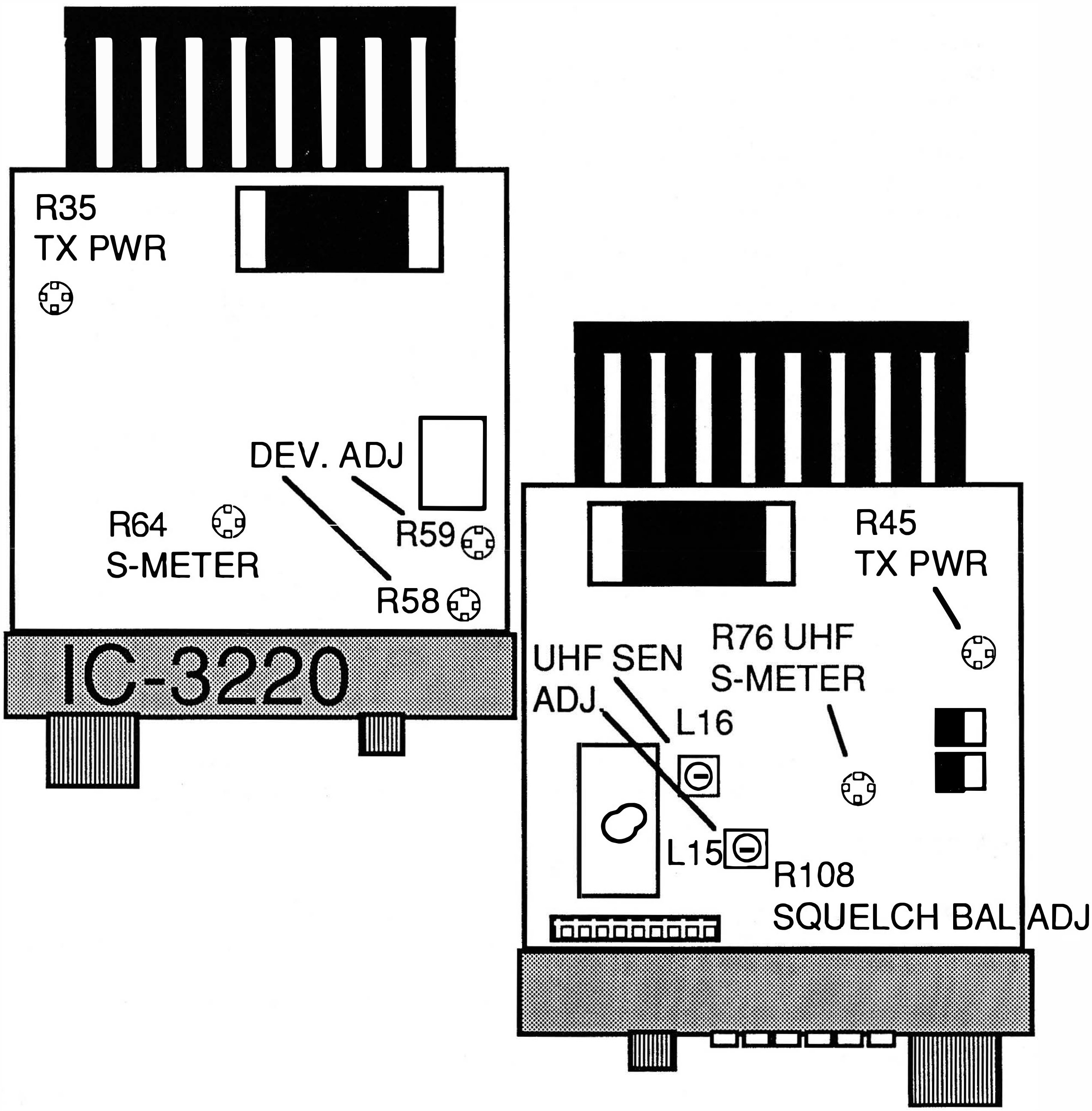
MORE ---



Caution

ICOM IC-3220

ALIGNMENT CONTROLS





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ICOM H16

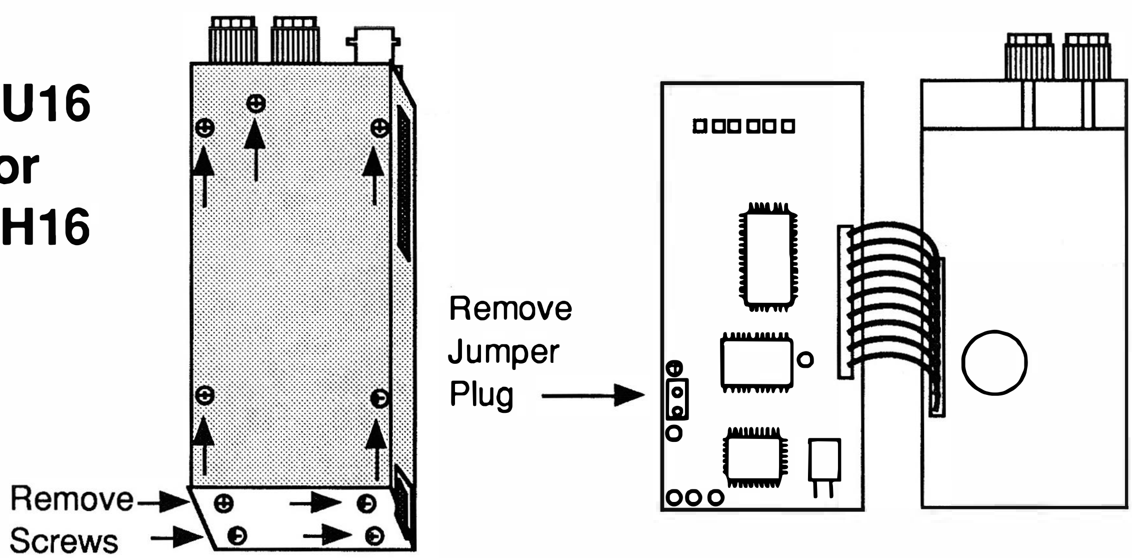
USER PROGRAMMABLE MODIFICATION

1. Remove battery and antenna.
2. Remove 9 screws and open Radio.
3. Locate and remove Jumper plug.
4. Reassemble the radio.

Programming commands:

1) Hold down [FUNCTION] key and press [1] [5] [9] [3] [5] [7].
2) Hold down [FUNCTION] and press :
   - [1] - Transmit PL tone. (2 digits)
   - [2] - Receive PL Tone. (2 digits)
   - [4] - Offset in MHz. (ie. +05000 =+5 MHz)
   - [5] - Frequency.
   - [7] - Rename Ch#
   - [8] - Time out Timer
   - [9] - TX Inhibit
3) Enter #'s and press [Ent].
4) To Exit Programming mode Hold [FUNCTION] and press [CLR].

IC-U16 or IC-H16



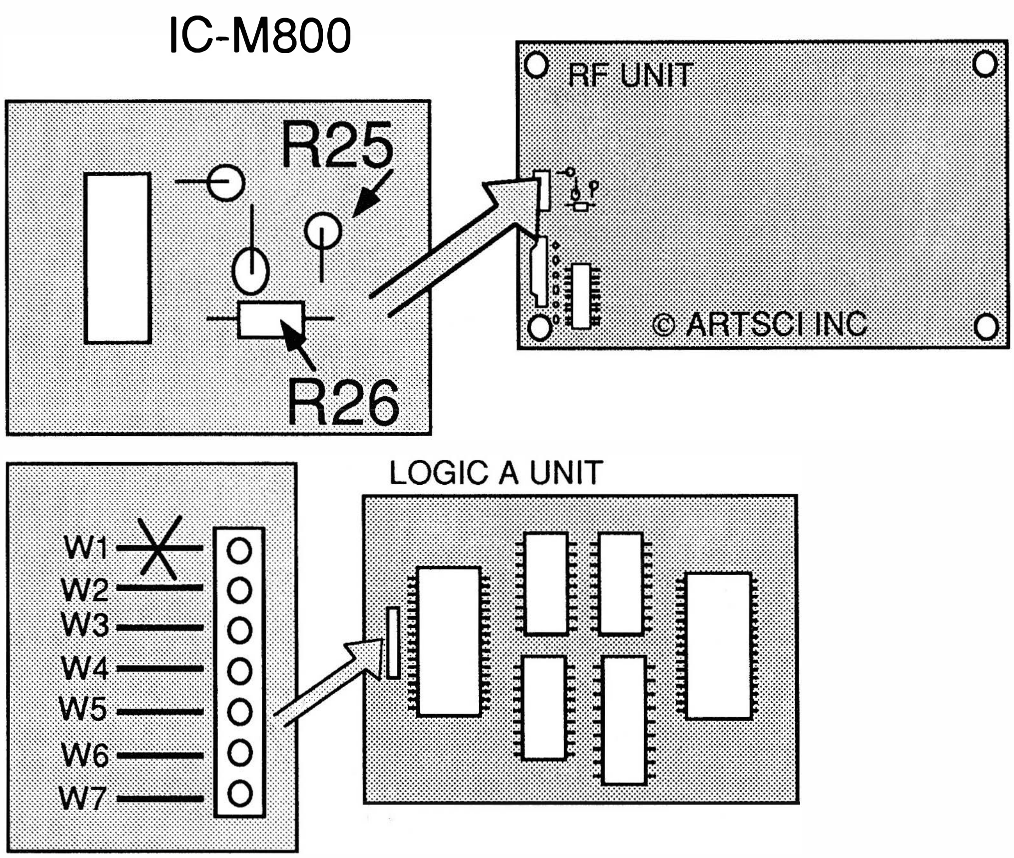

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ICOM IC-M800

EXPANDED RF

1. Remove power and antenna.
2. Open radio and find RF unit.
3. Locate and cut Resistor R25 & R26.
4. Locate Logic A unit.
5. Locate and cut jumper W1.
6. Reassemble the radio.



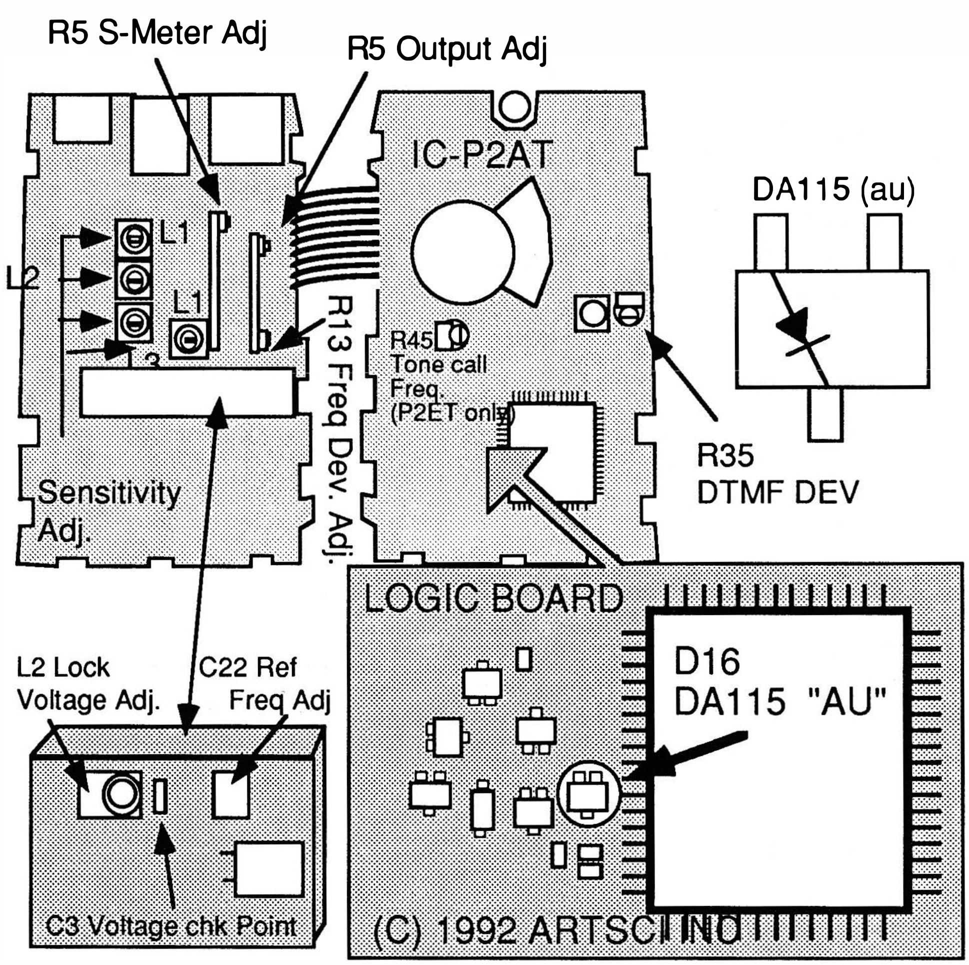

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ICOM IC-P2AT

EXPANDED RF /ALIGNMENT CONTROLS

1. Remove battery and antenna.
2. Remoce screws and open radio.
3. Install Diode D16 (symbol AU, DA115) (see drawing).
4. Reassemble radio.
5. Reset Microprocessor. (Press and hold [FUNC] and [V/M] and turn on. Wait for display to normalize before releasing buttons)



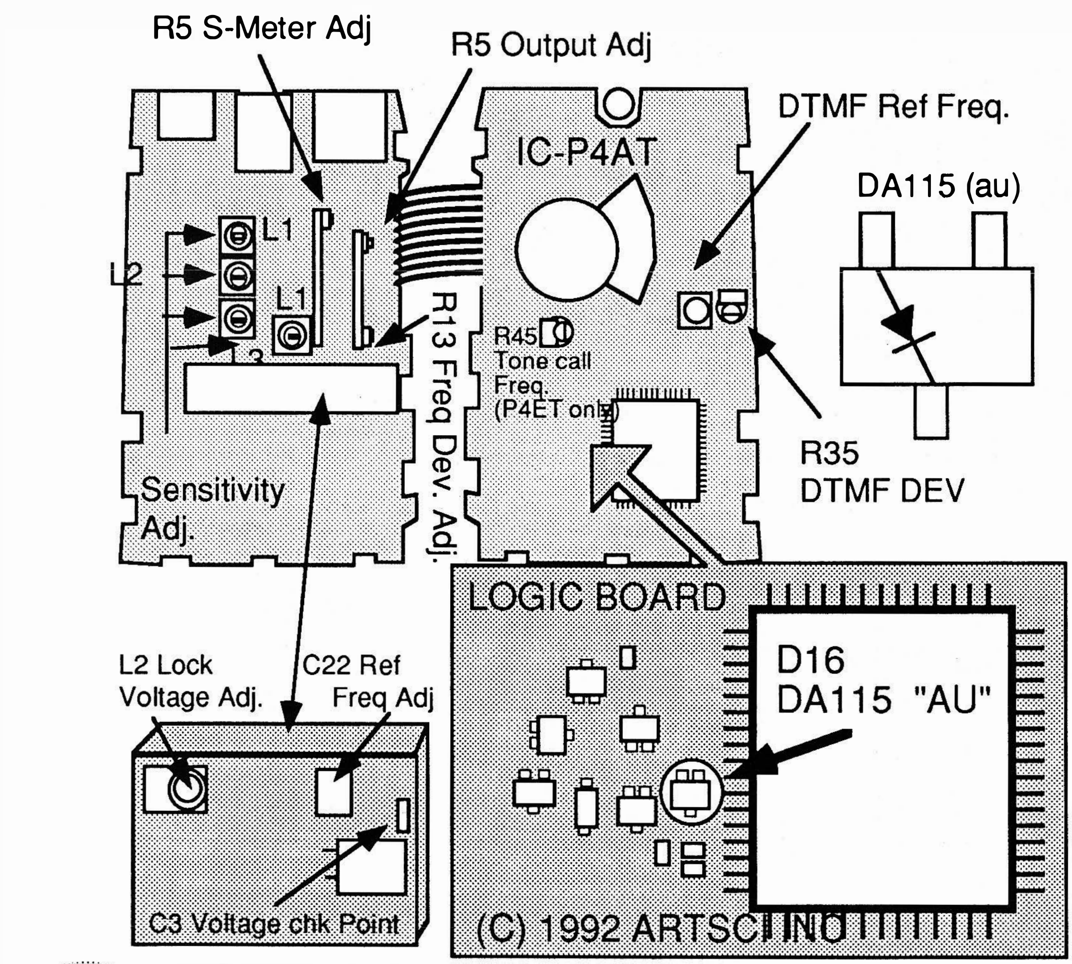


Caution

ICOM IC-P4AT

EXPANDED RF

1. Remove battery and antenna.
2. Remoce screws and open radio.
3. Install Diode D16 (DA115 symbol AU) (see drawing).
4. Reassemble radio.
5. Reset Microprocessor. (Press and hold [FUNC] and [V/M] and turn on. Wait for display to normalize before releasing buttons)





Caution

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ICOM IC-R71

EXPANDED RF
Receive down to 5 KHz.

1. Enter the memory channel mode and select any memory channel.
2. Push the [FUNCTION] key and [CLEAR MEMORY] button.
3. Tune (rock) memory channel knob and the main dial at the same time.
   Keep rocking both until frequency display goes to 00.00.
4. Tune UP only! If you tune down the display will return to 96 KHz.

Display Failure

Replace the following components:

C14 = 33μ 16v.
C20 = 10μ 16v.
C15 = 4.7μ 25v.
C17 = 3.3μ 50v.
C18 = 0.1μ 50v.
C21 = 10μ 16v.
C19 = 10μ 16v.
C22 = 10μ 16v.
C16 = 3.3μ 50V.

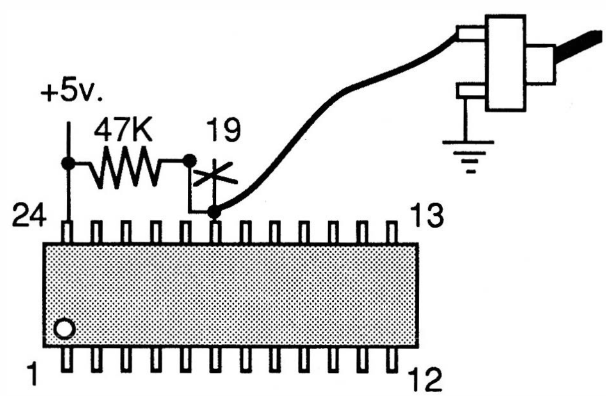


Caution

ICOM IC-R7000

100 MORE MEMORY CHANNELS

1. Remove power and antenna.
2. Remove screws and open case.
3. Locate the logic board.
4. Locate pin 19 on IC-8.
5. Cut foil trace to ground.
6. Attach a 47K Ohm resistor and a switch as shown.
7. Reassemble the radio.



Operation:

When the switch is closed, memory channels 0-99 will operate.
When the switch is open, memory channel 100-200 will operate.

Scanning will operate in only one memory bank at a time.



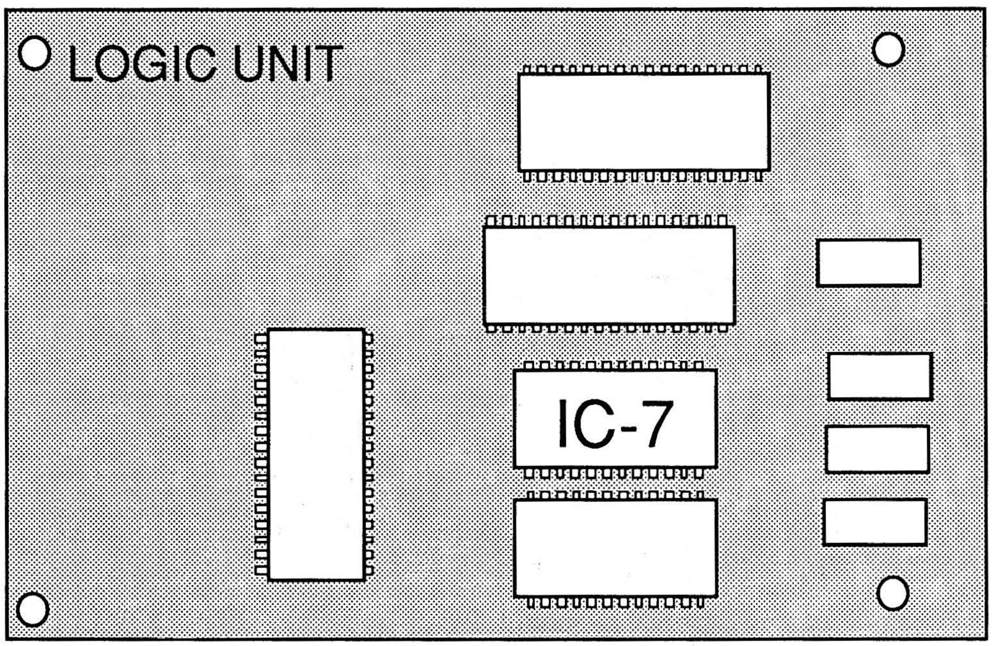
Caution

ICOM IC-RP1220, RP1520, RP4020, RP4520

CTCSS DEFAULT MODIFICATION

1. Remove power and antennas
2. Remove bottom cover (12 screws)
3. Locate and remove IC-7 (it is in a socket)
4. Install a new IC-7 (Part # SC1222 ICOM Part # 900-08922)
5. Reset cover and screws.

Note: No reset is required.



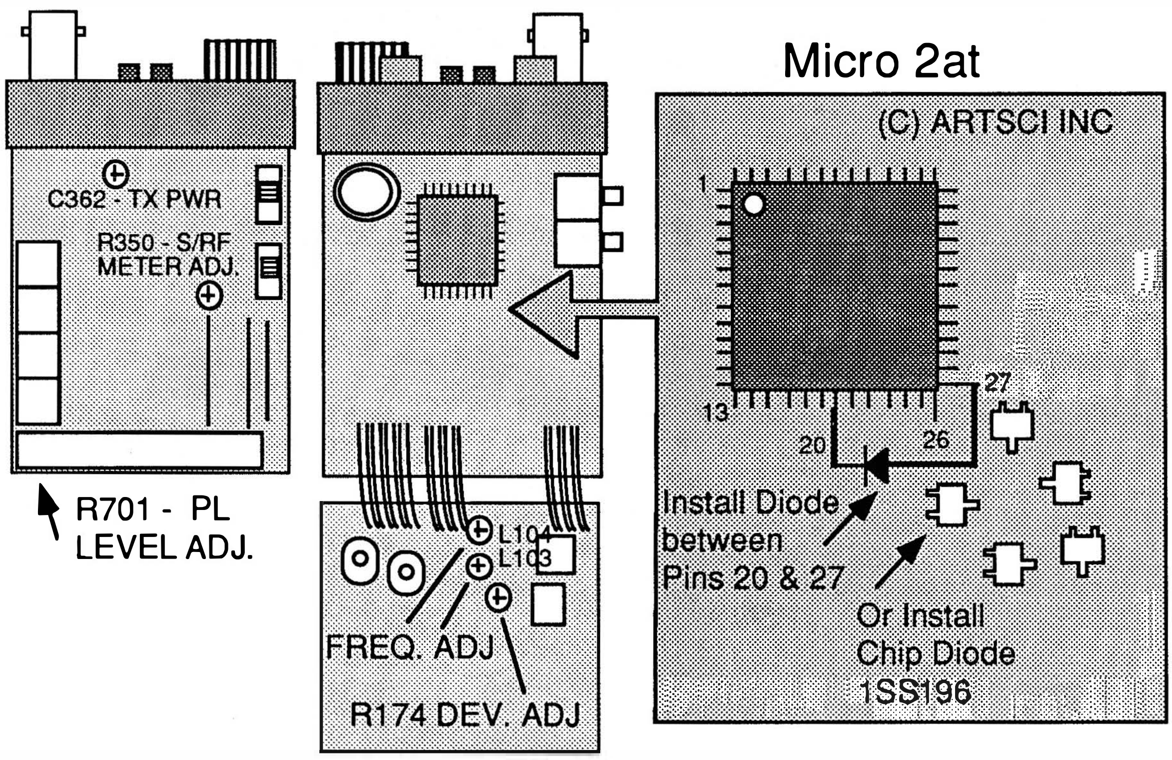


ICOM μ2AT

EXPANDED RF

1. Remove battery and antenna.
2. Remove 4 screws and open Radio.
3. Separate shield & top circuit board from bottom board.
4. Locate Microprocessor board.
5. Tack solder a 1N914 Diode across Pin 20 & 27
   or attach a chip Diode 1SS196 as shown.
6. Reassemble the radio.
7. Reset the microprocessor. (Push and hold lamp and turn on power.)

Note: This diode is placed across pin 20 & 27 of CPU. Drawing is not to Scale.
MICROPROCESSOR is under the Tone Pad (under shield)



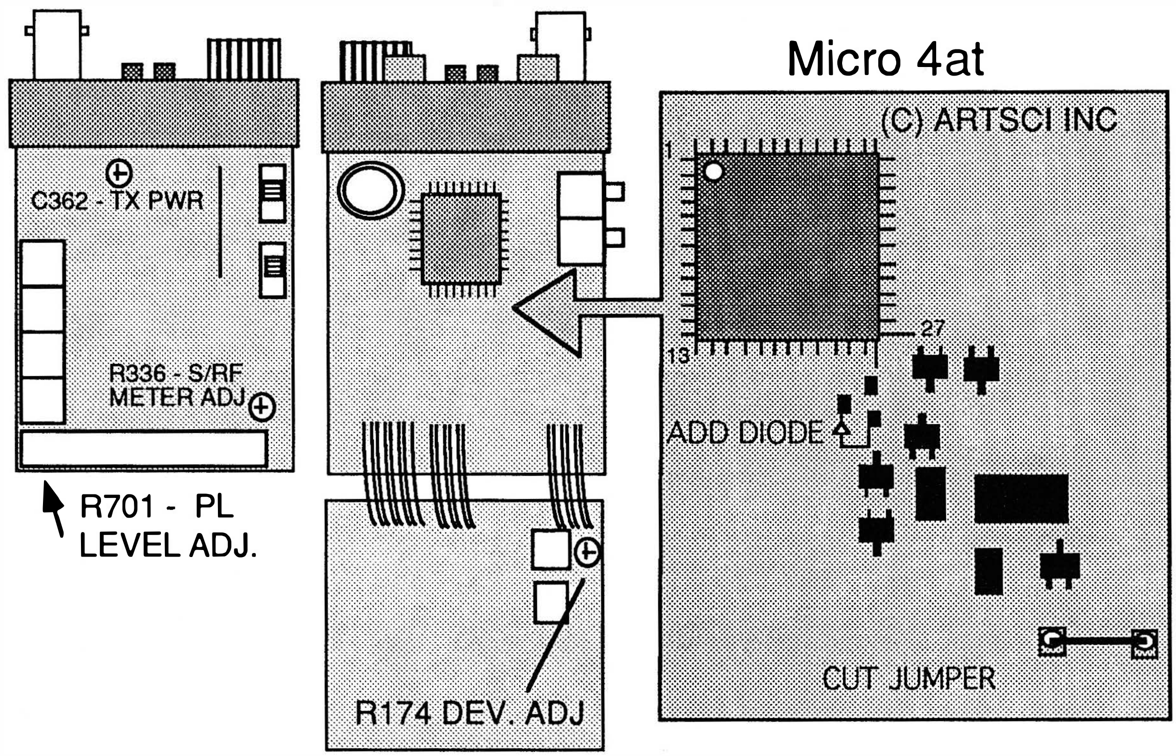


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ICOM μ4AT

EXPANDED RF

1. Remove battery and antenna.
2. Remove 4 screws and open Radio
4. Tack solder a 1N914 Diode across chip diode position.
   or attach a chip Diode 1SS196.
5. Reassemble the radio.
6. Reset the microprocessor. (Push and hold lamp and turn on power.)





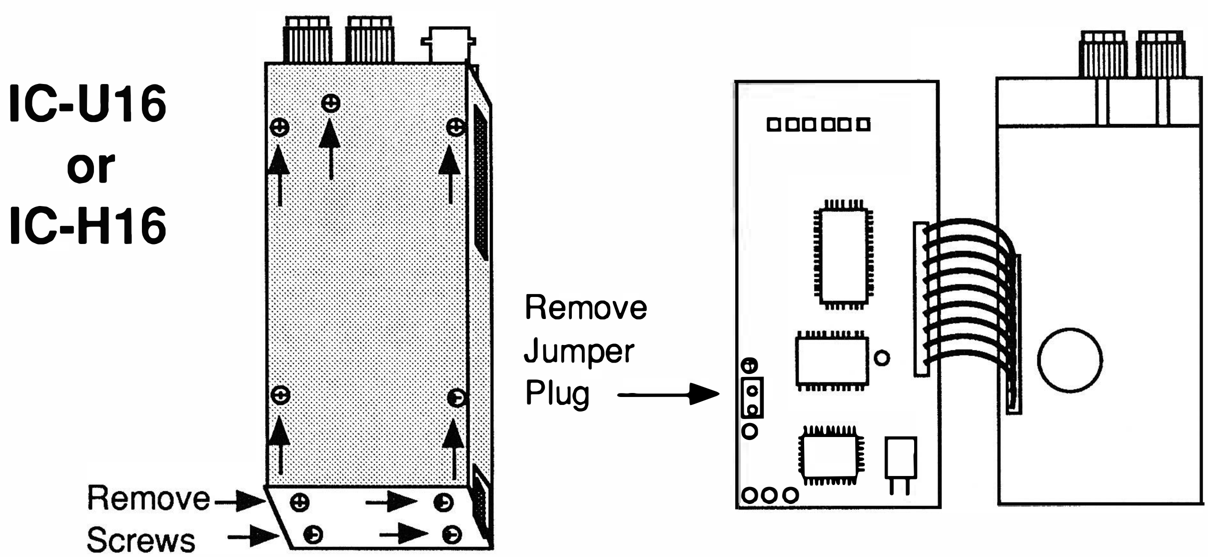
ICOM U16

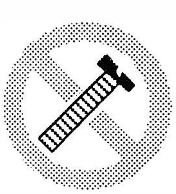
USER PROGRAMMABLE MODIFICATION

1. Remove battery and antenna.
2. Remove 9 screws and open the radio.
3. Locate and remove Jumper plug.
4. Reassemble the radio.

Programming commands:

1) Hold down [FUNCTION] key and press [1] [5] [9] [3] [5] [7].
2) Hold down [FUNCTION] and press :
   - [1] - Transmit PL tone. (2 digits)
   - [2] - Receive PL Tone. (2 digits)
   - [4] - Offset in MHz. (ie. +05000 =+5 MHz)
   - [5] - Frequency.
   - [7] - Rename Ch#
   - [8] - Time out Timer
   - [9] - TX Inhibit
3) Enter #'s and press [ENT].
4) To Exit Programming mode Hold [FUNCTION] and press [CLR].





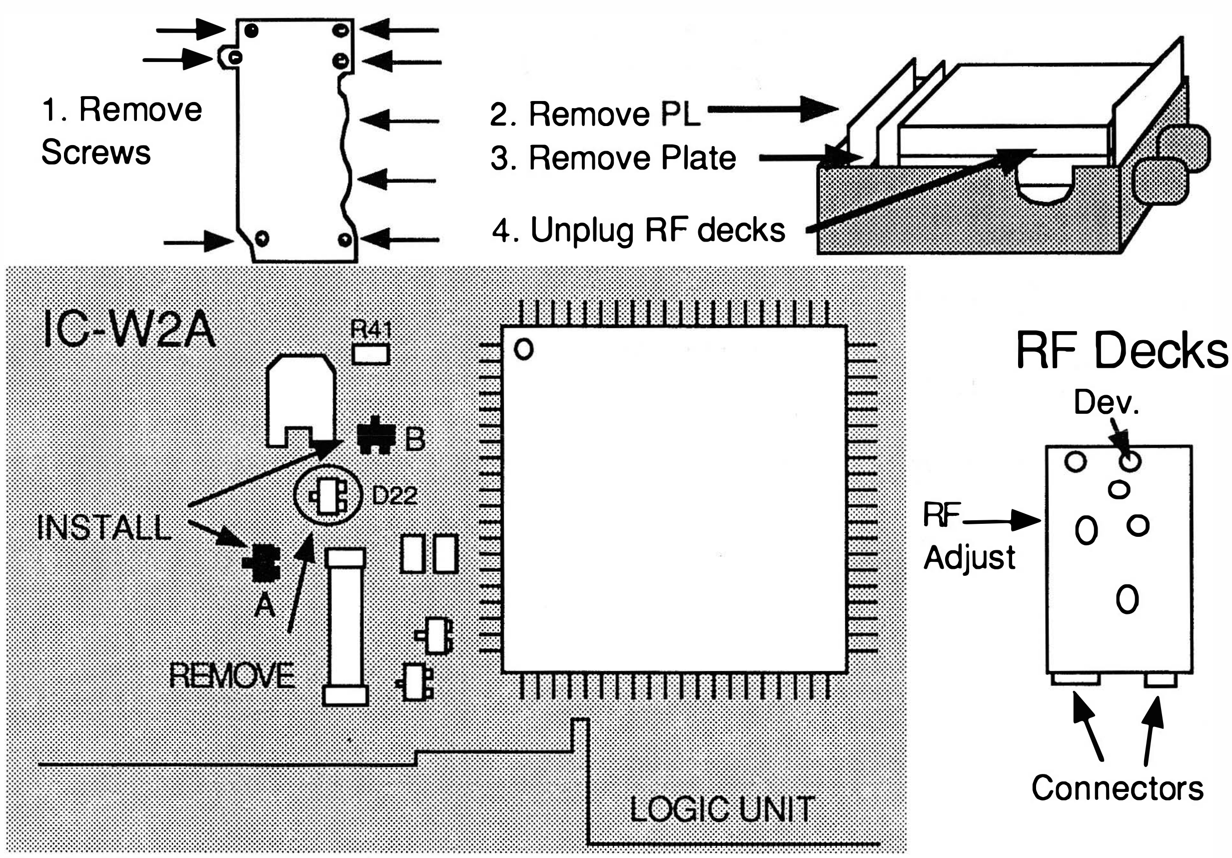
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ICOM IC-W2A

EXPANDED RF

1. Remove battery and antenna.
2. Remove screws from back panel and battery plate and open radio.
3. Remove PL deck and power plate.
4. Unplug VHF & UHF decks.
5. Remove Chip diode D22.
6. Attache Chip diodes to location points A & B.
   (Diode MA133 - Icom part # 1790000860)
7. Reassemble the radio.
8. Reset the CPU (Push and hold [FUNCTION} & [A] & [CLR] and turn radio on)



IC-W2A KEYBOARD COMMANDS:

RX Expansion	Push and hold [#] & [B] & [3] and turn power on.
Direct Entry	Set VFO PL to 100 hz on VHF and UHF!!!!
XBand Repeat on	Hold [FUNCTION] press [2] and then [#].
XBand Repeat off	Push and hold [FUNCTION] & [#].
Display Test	Push and hold [#] & [LIGHT] & [B]

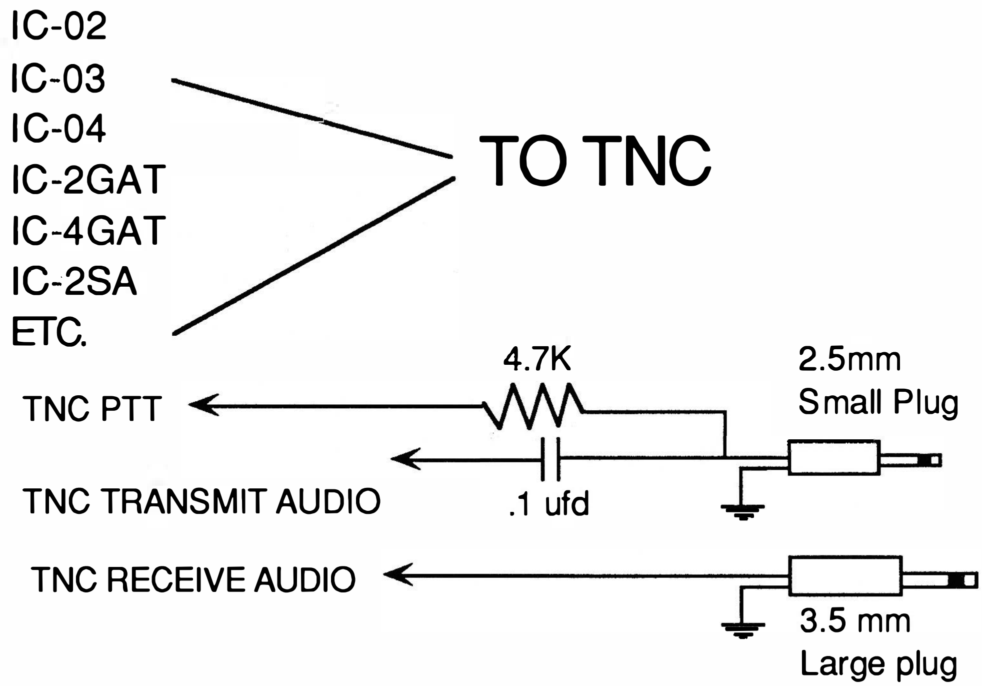


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ICOM HT's TO TNC'S

INTERFACE CABLES



Caution

ICOM RADIOS

CPU RESET

2GAT TURN RADIO ON, HOLD [LIGHT] & [FUNCTION], TURN RADIO OFF, TURN ON AND RELEASE BUTTONS.

02AT BELOW SERIAL # 34,000 - PUSH BUTTON ON MAIN BOARD NEXT TO LITHIUM BATTERY.
ABOVE SERIAL # 34,000 - HOLD [FUNCTION] AND TURN RADIO ON.

2SA HOLD [LIGHT] & [MONITOR] AND TURN RADIO ON.

2SAT HOLD [FUNCTION] & [A] AND TURN RADIO ON.

2SRA HOLD [FUNCTION] & [A] & CLR] & TURN RADIO ON.

u2AT HOLD [LIGHT] AND TURN RADIO ON.

03AT BELOW SERIAL # 34,000- PUSH BUTTON ON MAIN BOARD NEXT TO LITHIUM BATTERY.
ABOVE SERIAL # 34,000 - HOLD [FUNCTION] AND TURN RADIO ON.

3SA HOLD [LIGHT] & [MONITOR] AND TURN RADIO ON.

3SAT HOLD [FUNCTION] & [A] AND TURN RADIO ON.

4GAT TURN RADIO ON, HOLD [LIGHT] & [FUNCTION], TURN RADIO OFF, TURN ON AND RELEASE BUTTONS.

04AT BELOW SERIAL # 34,000 - PUSH BUTTON ON MAIN BOARD NEXT TO LITHIUM BATTERY.

ABOVE SERIAL # 34,000 - HOLD [FUNCTION] AND TURN RADIO ON.

4SA HOLD [LIGHT] & [MONITOR] AND TURN RADIO ON.

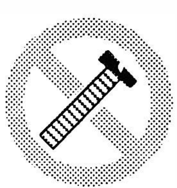
4SAT HOLD [FUNCTION] & [A] AND TURN RADIO ON.

4SRA HOLD [FUNCTION] & [A] & CLR] & TURN RADIO ON.

u4AT HOLD [LIGHT] AND TURN RADIO ON.

12AT HOLD [FUNCTION] AND TURN RADIO ON.

12GAT TURN RADIO ON, HOLD [LIGHT] & [FUNCTION], TURN RADIO OFF, TURN ON AND RELEASE BUTTONS.


Caution

ICOM RADIOS

CPU RESET (PART 2)

24AT	HOLD [FUNCTION] & [A] AND TURN RADIO ON.
27	PUSH RESET BUTTON UNDER TOP COVER
28	INSERT A TOOTHPICK INTO HOLE IN THE CORNER OF THE BOTTOM COVER PRESSING THE RESET BUTTON.
32AT	HOLD [FUNCTION] & [A] & [LIGHT] AND TURN POWER ON.
37	PUSH RESET BUTTON UNDER TOP COVER.
38	INSERT TOOTHPICK INTO HOLE IN THE CORNER OF THE BOTTOM COVER PRESSING THE RESET BUTTON.
47	PUSH RESET BUTTON UNDER TOP COVER
48	INSERT TOOTHPICK INTO HOLE IN THE CORNER OF THE BOTTOM COVER PRESSING THE RESET BUTTON.
228	HOLD [SQUELCH/MONITOR] & [LOCK] AND TURN RADIO ON.
229A	HOLD [SET] & [MW] AND TURN RADIO ON.
271	REPROGRAM RAM CARD.
275	HOLD [M-CL] AND TURN RADIO ON.
375	HOLD [M-CL] AND TURN RADIO ON.
448	HOLD [SQUELCH/MONITOR] & [CLOCK] AND TURN RADIO ON.
471	REPROGRAM RAM CARD.
475	HOLD [M-CL] AND TURN RADIO ON.
575	HOLD [M-CL] AND TURN RADIO ON.
725	HOLD [FUNCTION] & [MW] AND TURN RADIO ON.
726	HOLD [FUNCTION] & [MW] AND TURN RADIO ON.

ICOM RADIOS

CPU RESET (PART 3)

761	HOLD [M-CLEAR] AND TURN RADIO ON.
765	HOLD [M-CLEAR] AND TURN RADIO ON.
781	HOLD [M-CLEAR] AND TURN RADIO ON.
900	HOLD [MR] AND TURN POWER OFF AND THEN ON AGAIN.
901A	TURN RADIO ON, PUCH [CHECK] & [MW]
970	HOLD [MW] AND TURN RADIO ON.
1200	INSERT TOOTHPICK INTO HOLE IN THE CORNER OF THE BOTTOM COVER PRESSING THE RESET BUTTON.
1201	HOLD [SQUELCH/MONITOR] & [LOCK] AND TURN RADIO ON.
1220	TURN RADIO OFF FOR A FEW MINUTES AND THEN PRESS SWITCH S1 ON LOGIC BOARD.
1271	REPROGRAM RAM CARD.
1275	HOLD [M-CL] AND TURN RADIO ON.
1520	TURN RADIO OFF FOR A FEW MINUTES AND THEN PRESS SWITCH S1 ON LOGIC BOARD.
1600	TURN POWER OFF, WAIT A FEW MINUTES AND TURN POWER ON.
3200	HOLD [F] BUTTON AND TURN POWER ON.
3210	HOLD [SQUELCH/MONITOR] & [LOCK] AND TURN RADIO ON.
3220	HOLD [SET] & [MW] AND TURN RADIO ON
2400	HOLD [SUB VOL] AND [MW] AND TURN RADIO ON.
2500	HOLD [SUB VOL] AND [MW] AND TURN RADIO ON.

Caution

ICOM RADIOS

CPU RESET (PART 4)

4020 TURN RADIO OFF FOR A FEW MINUTES AND THEN PRESS SWITCH S1 ON LOGIC BOARD.

4520 TURN POWER OFF, WAIT A FEW MINUTES AND TURN POWER ON.

A2 HOLD [FUNCTION] & [PTT] & TURN POWER ON.

A20 HOLD [FUNCTION] & CLEAR] & TURN POWER ON.

A21 HOLD [FUNCTION] & CLEAR] & TURN POWER ON.

H8 RECLONE OR HOLD [PTT] & [CLONE] & TURN POWER ON.

H10 RECLONE OR HOLD [PTT] & [CLONE] & TURN POWER ON.

H16 RECLONE

H18 RECLONE

H19 RECLONE

M5 PUSH BUTTON ON MAIN BOARD NEXT TO LITHIUM BATTERY.

M7 TURN RADIO ON & HOLD [HI/LOW] & [LOCK] & TURN OFF POWER.
PUSH [CH16D] TO SELECT DIAL MODE.

M11 TURN ON & HOLD [LIGHT] & [FUNCTION] & TURN OFF POWER & ON AGAIN.
PUSH [CH16D] TO SELECT DIAL MODE.

M55 REMOVE CLEAR PLASTIC SCREW FROM BOTTOM COVER,
INSERT A TOOTHPICK TO PUSH RESET BUTTON.

M56 TURN RADIO ON & HOLD [CH16] &[MR] & TURN OFF & TURN ON.

M80 DISCONNECT LITHIUM BATTERY.

M100 TURN RADIO ON & HOLD [SQUELCH] KNOB & PRESS RESET.

ICOM RADIOS

CPU RESET (PART 5)

M120	TURN RADIO ON & HOLD [CH16] & [USA], TURN RADIO OFF AND BACK ON.
M500	HOLD [DIMMER] & 13/67] & TURN POWER ON.
R1	HOLD [FUNCTION] & [CL] & TURN POWER ON.
R72	HOLD [MW] & TURN POWER ON.
R100	HOLD [FUNCTION] & [ENT] & TURN POWER ON.
R9000	HOLD [M-WRITE] AND TURN RADIO ON.
U8	RECLONE OR HOLD [PTT] & [CLONE] & TURN POWER ON.
U10	RECLONE OR HOLD [PTT] & [CLONE] & TURN POWER ON.
U16	RECLONE.
U18	RECLONE
U19	RECLONE.
U200	RECLONE
U400	RECLONE
V100	RECLONE
V200	RECLONE
W2A	HOLD [FUNCTION] & [A] & [CLR] AND TURN RADIO ON.

Performance Report

Radio ______________________________ Date ____________

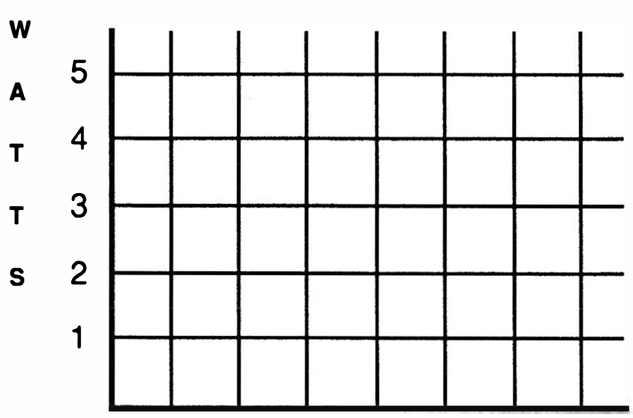
Owner : Name ____

Address ______________________________________

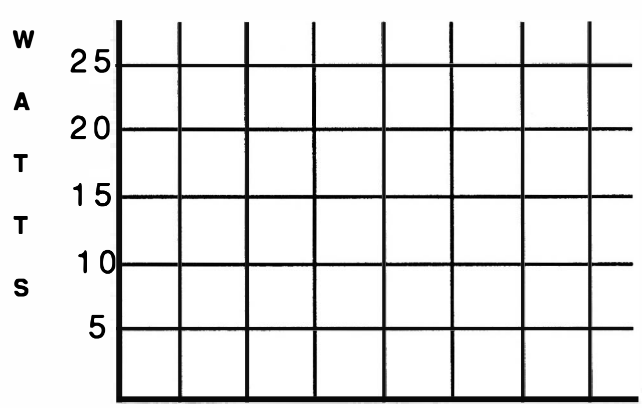
City ____________________ St. ______ Zip ____________

Phone ( ) - ____________________________________

Description	Before	After
Power out (Low)	________ Watts	________ Watts
Power out (High)	________ Watts	________ Watts
Frequency Error (Simplex)	________ Hz	________ Hz
Frequency Error (Offset)	________ Hz	________ Hz
Receive Sensitivity (Mid-band)	________ uv	________ uv
Receive Sensitivity (_____MHz)	________ uv	________ uv
Receive Sensitivity (_____MHz)	________ uv	________ uv
PL Deviation	________ Hz	________ Hz
DTMF Deviation	________ KHz	________ KHz
Audio Deviation	________ KHz	________ KHz
Lowest usable Freq @ .5 Pwr	________ MHz	________ MHz
Highest usable Freq @ .5 Pwr	________ MHz	________ MHz



Frequency



Frequency

Radio / Tech Modifications

Kenwood Radio Modifications

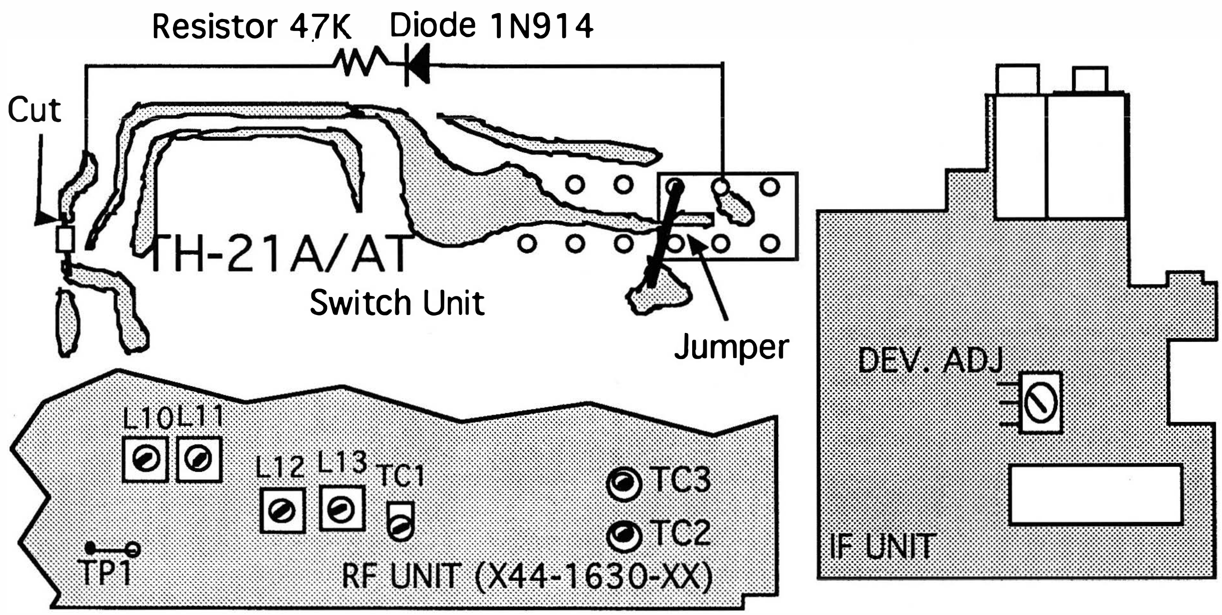
Radio / Tech Modifications
Kenwood Radio Modifications

KENWOOD TH-21A/AT

EXPANDED RF
140-159 MHz

1 Disconnect the battery and antenna.
2. Remove knobs, antenna nut ring and plastic top
3. Remove front panel.
4. Locate switch unit. (PCB X41-1590-00) This unit has the Vol, Sqh etc.
5. Cut trace between R1 and D4,D5
6. Install a jumper from the common point of R11, R5 & 5C to the corner of the tone switch.
7. Install a 1N914 diode and 48K resistor from the center top pin of the tone switch to the end of resistor R1. (R1 was cut in step 5).
   Note: Cathode end of the diode goes to the tone switch top center pin.
   Cathode end of a diode has the line.
8. Adjust L10,L11,L12,L13,TC1,TC2 & TC3 for maximum upper frequency range.
9. Reassemble the radio.

Depress the tone switch to receive from 140 to 149 MHZ
Tone switch off for 150 -159 MHz.

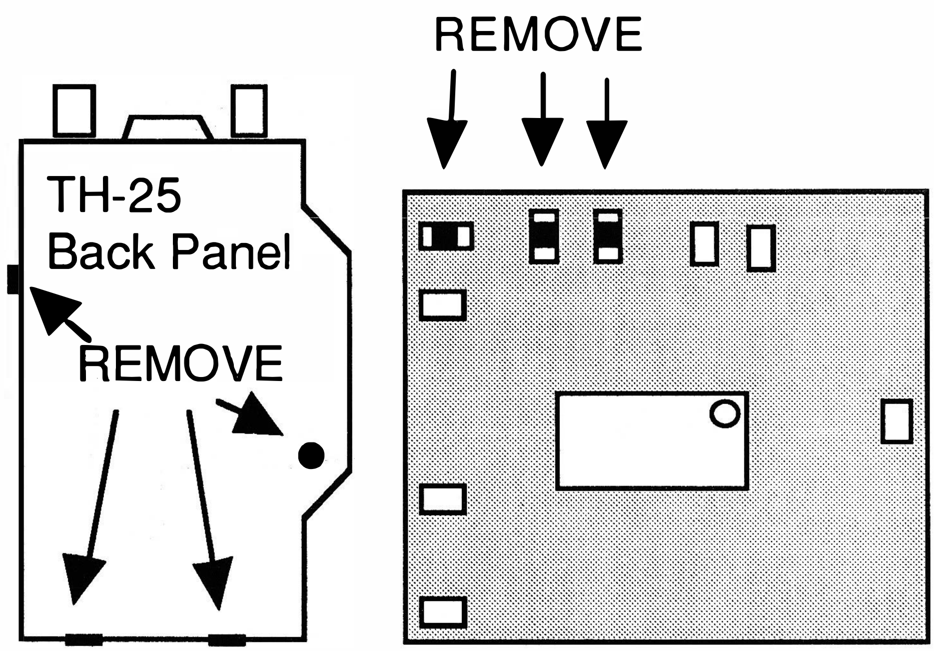


Caution

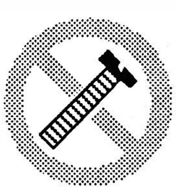
KENWOOD TH-25AT

EXPANDED RF

1 Disconnect the power and antenna.
2. Remove the volume, squelch and tuning control knobs
3. Remove the nuts from the volume control and tuning controls.
4. Remove screw located by the PTT switch.
5. Remove screw by the speaker jack
6. Remove two screws from the battery plate.
7. Carefully pull the front panel from the radio. Do not break any wires.
8. Gently lift the top panel from the radio by pulling it forward and then upwards. The O ring on the BNC connector will cause some tension.
9. Rotate the top panel towards the front of the radio to expose the .75" X .75" board.
10. Remove chip resistors R19, R20 & R21.
11. Reassemble the radio.
12. RESET the CPU. Hold down [M] and turn power on.

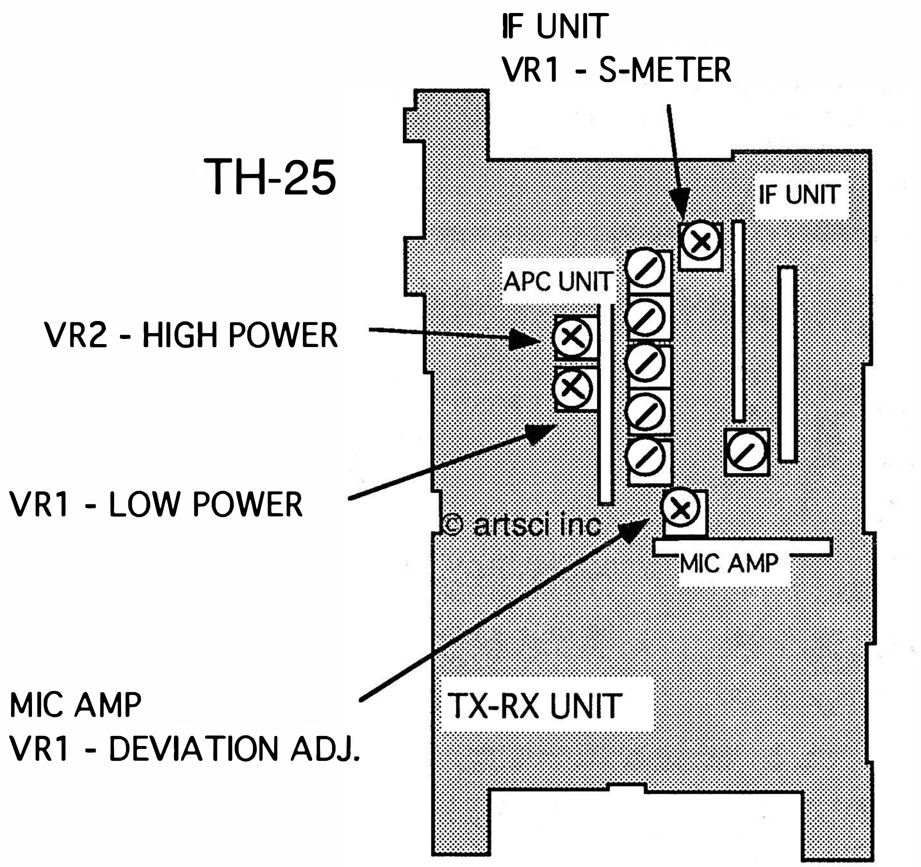


MORE ---



KENWOOD TH-25AT

ALIGNMENT CONTROLS



DTMF LEVEL -
VR1 ON SIGNALING UNIT

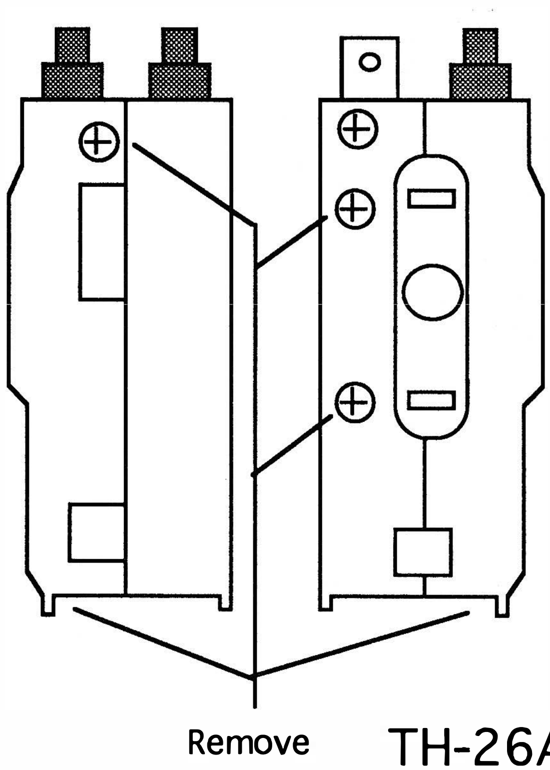

Caution

KENWOOD TH-26A

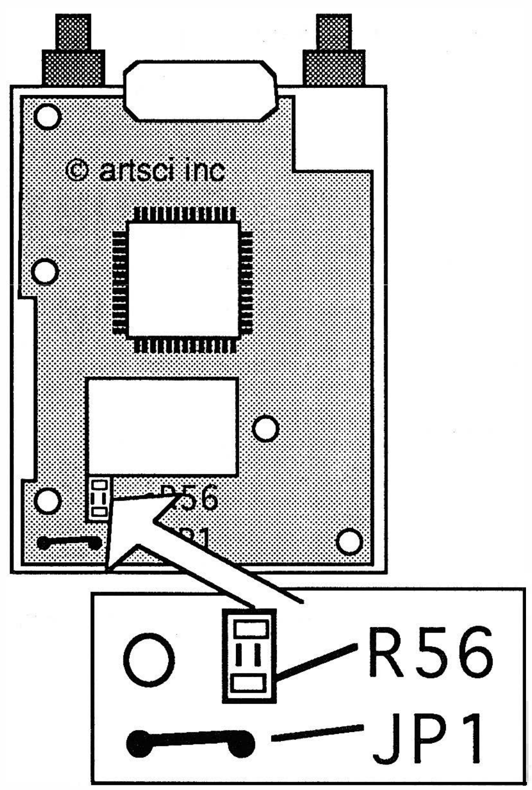
EXPANDED RF

1 Disconnect the power and antenna.
2. Remove 3 screws from the case and 2 from the battery plate.
3. Open the radio.
4. Remove jumper JP1. Use a soldering iron the remove the jumper. Do not pull the jumper or overheat the board.
5. Unsolder and remove chip resistor R56.
6. Reassemble the radio. Carefully re-seat the O-Ring on the BNC connector.
7. Reset the microprocessor. (Press and hold the [F] key and turn the power on.)

Note: Automatic offset selection will be disabled when this mod is performed.



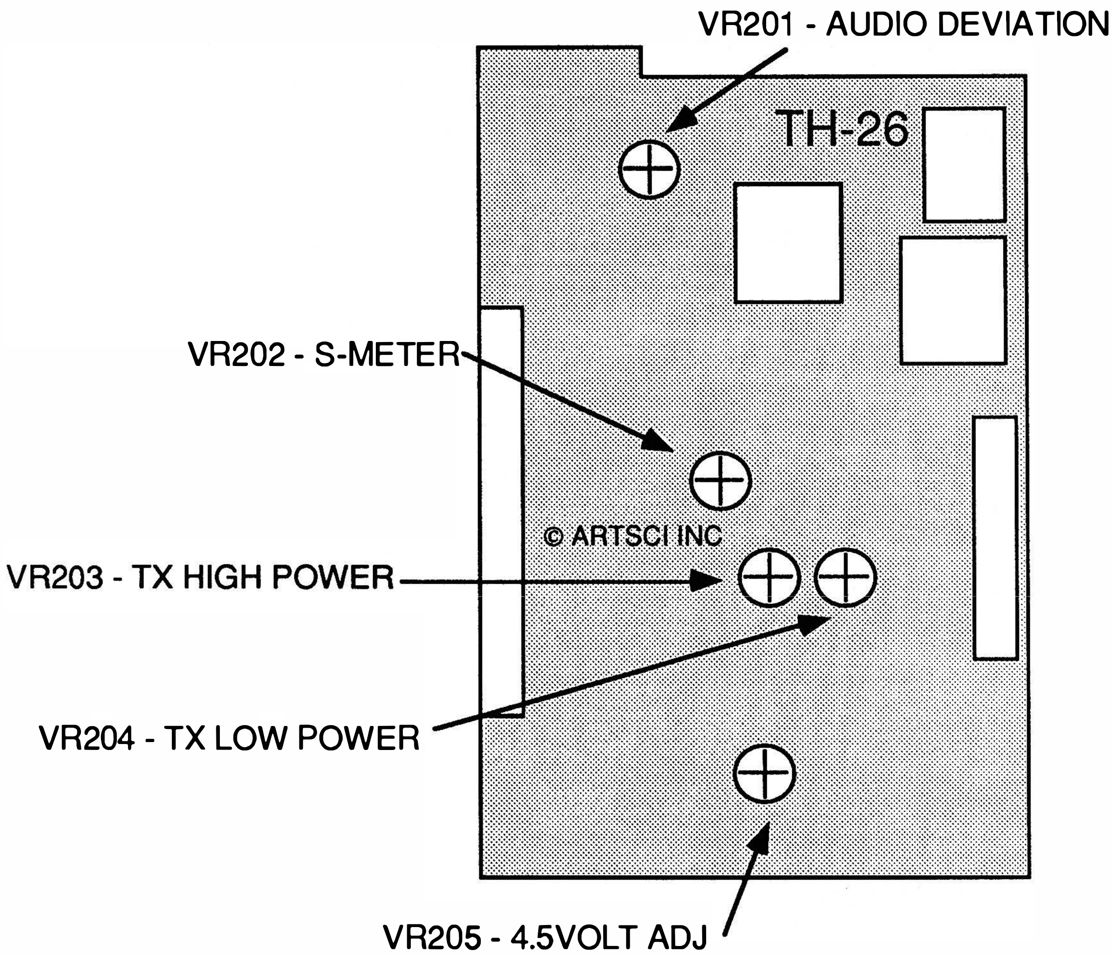
TH-26A



MORE ---

KENWOOD TH-26A

ALIGNMENT CONTROLS



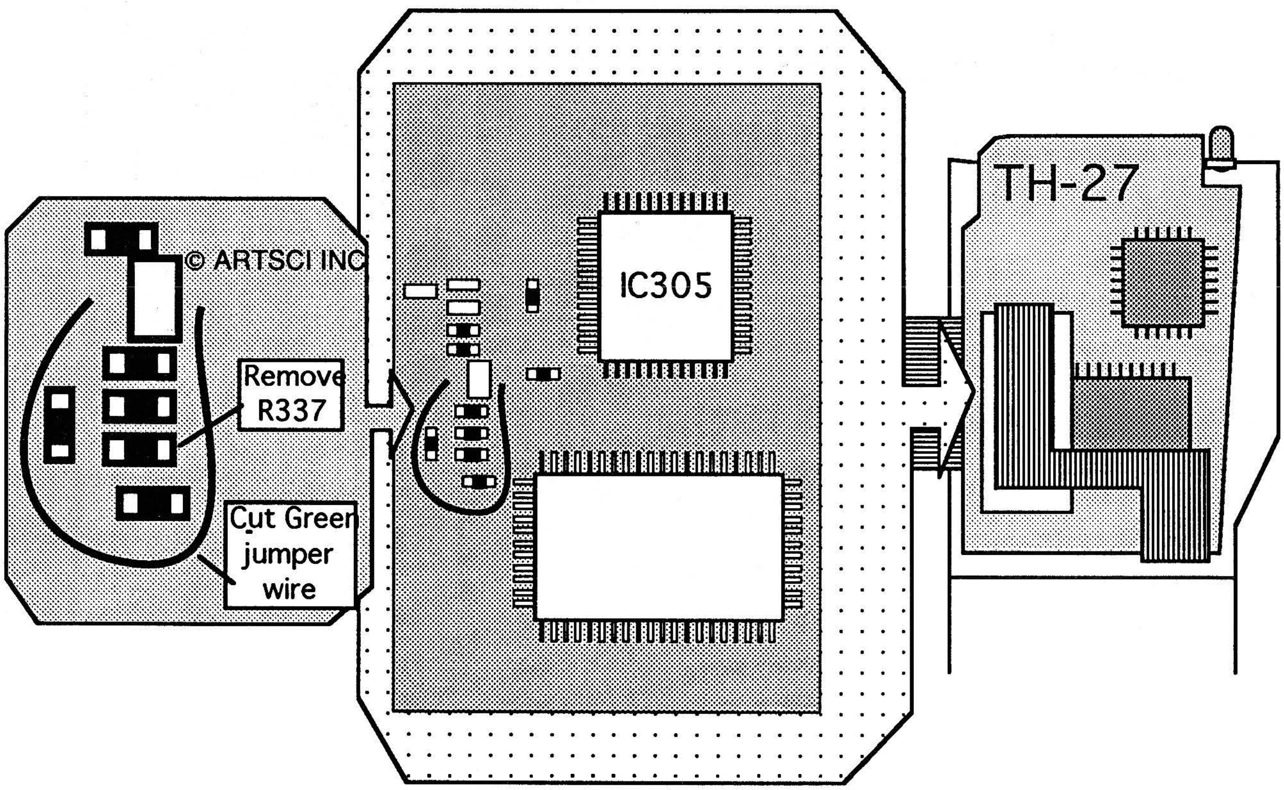

Caution

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KENWOOD TH-27A

EXPANDED RF

1. Disconnect the Power and antenna.
2. Remove 4 screws from the back panel.
3. Open the bottom of the front panel first and slide the panel downward.
4. Open the radio being careful not to break the flex cable.
5. Move the tone board out of the way to expose the green jumper wire located inside the front panel assembly.
6. Cut the GREEN Jumper wire.
7. Remove chip resistor R337. (Disables AM receive & auto offset)
8. Reassemble the radio. Carefully re-seat the O-Ring on the BNC connector.
9. Reset the Microprocessor. (Press and hold the [M] key and turn the power on.)

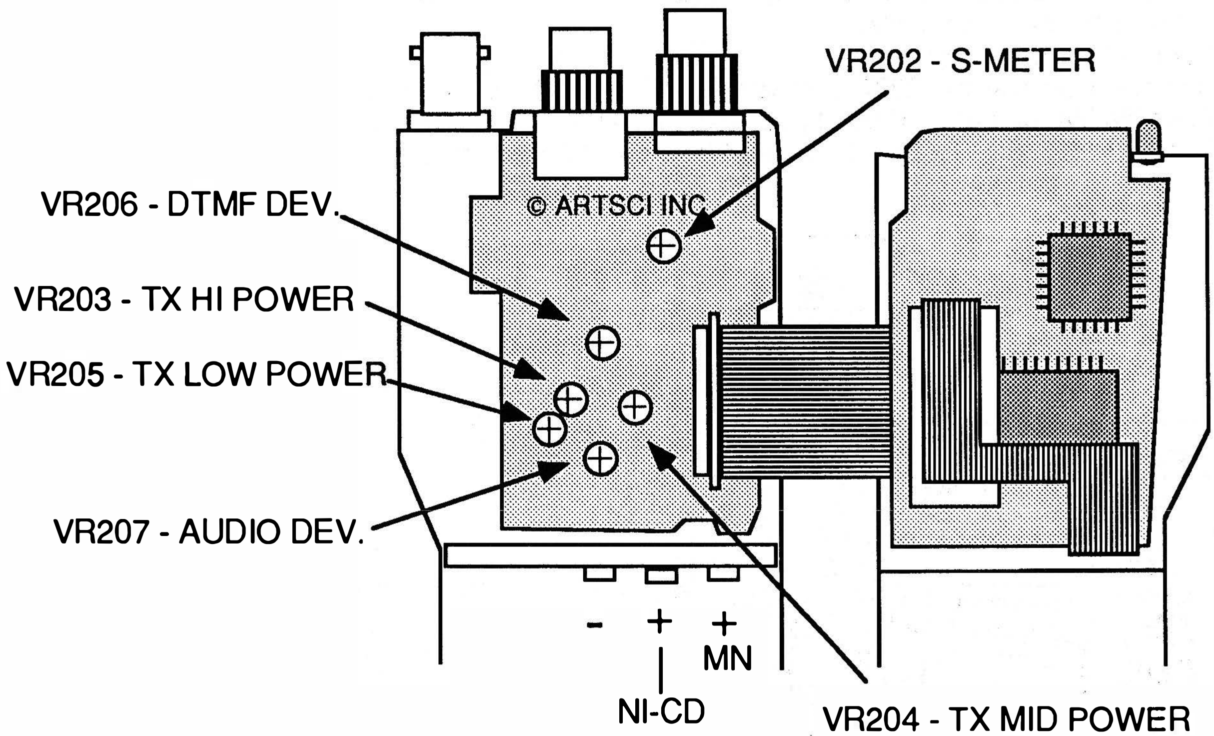


MORE ---



KENWOOD TH-27A

ALIGNMENT POINTS



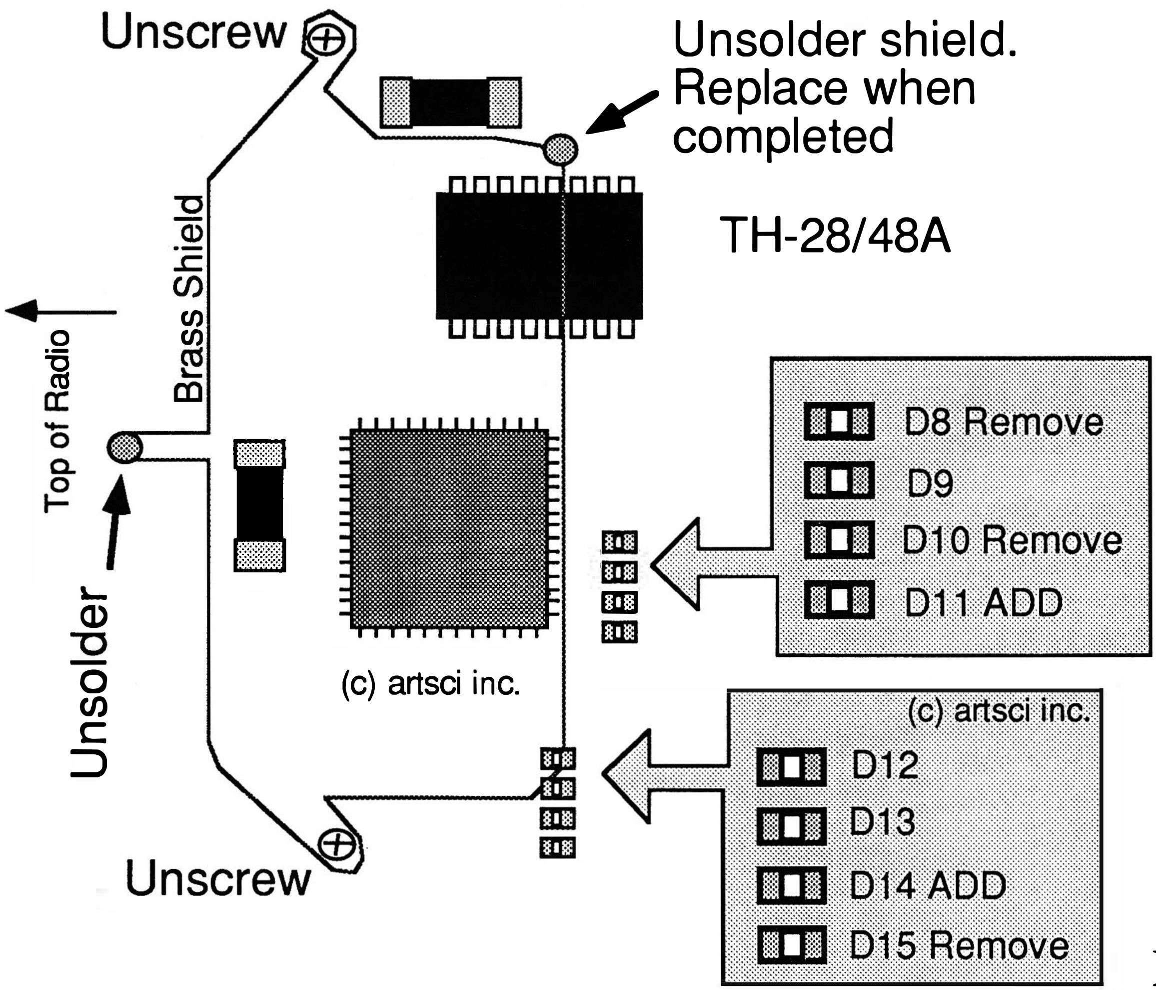
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KENWOOD TH-28A

EXPANDED RF

1. Disconnect the Batteru and antenna.
2. Remove 4 back case screws and open the radio.
3. Locate Brass Shield.
4. Unsolder the two solder tack point on the shield.
5. Remove the two screws holding the shield.
6. Locate chip diode positions D8.....D15.
7. Remove Diode D8,D10 & D15. (save the diodes)
8. Install Diodes D11 & D14. (used diodes removed in the previous step)
9. Replace the brass shield. (replace the screws and the solder tack points.
10. Reassemble the radio.
11. Reset the microprocessor. (Press and hold [F] and turn power on)



MORE --

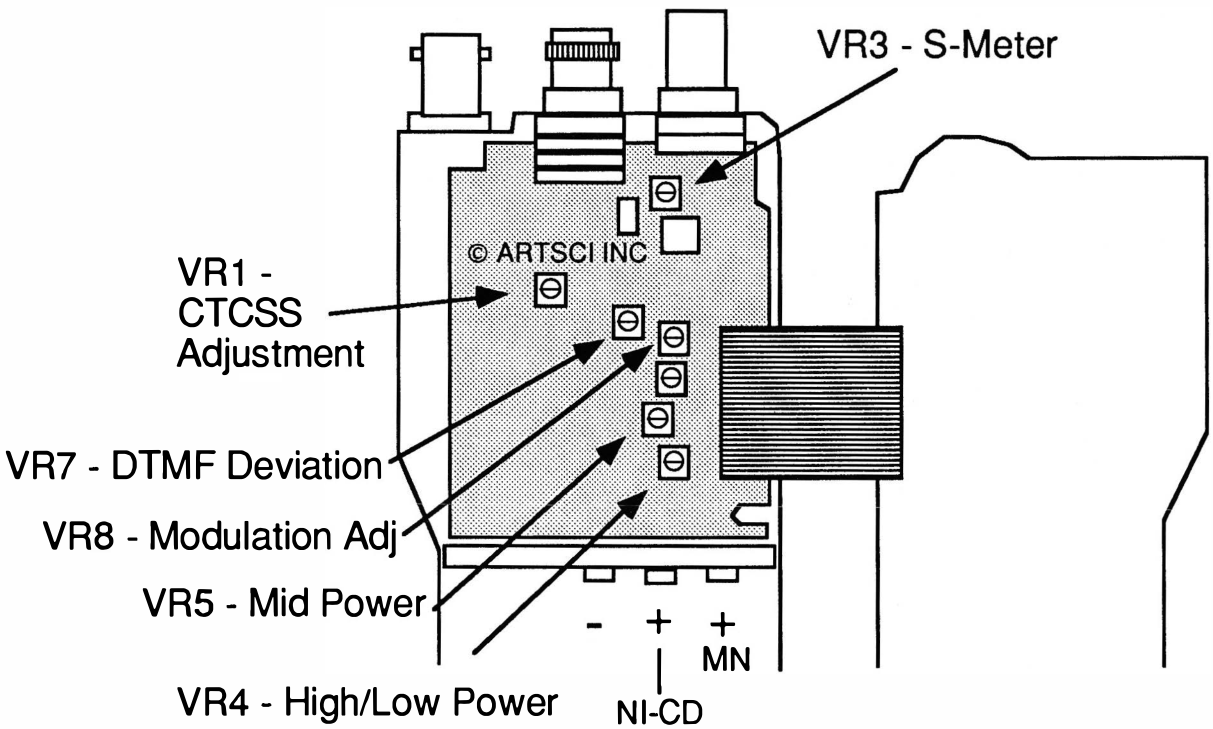


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KENWOOD TH-28A

ALIGNMENT POINTS

TH-28A

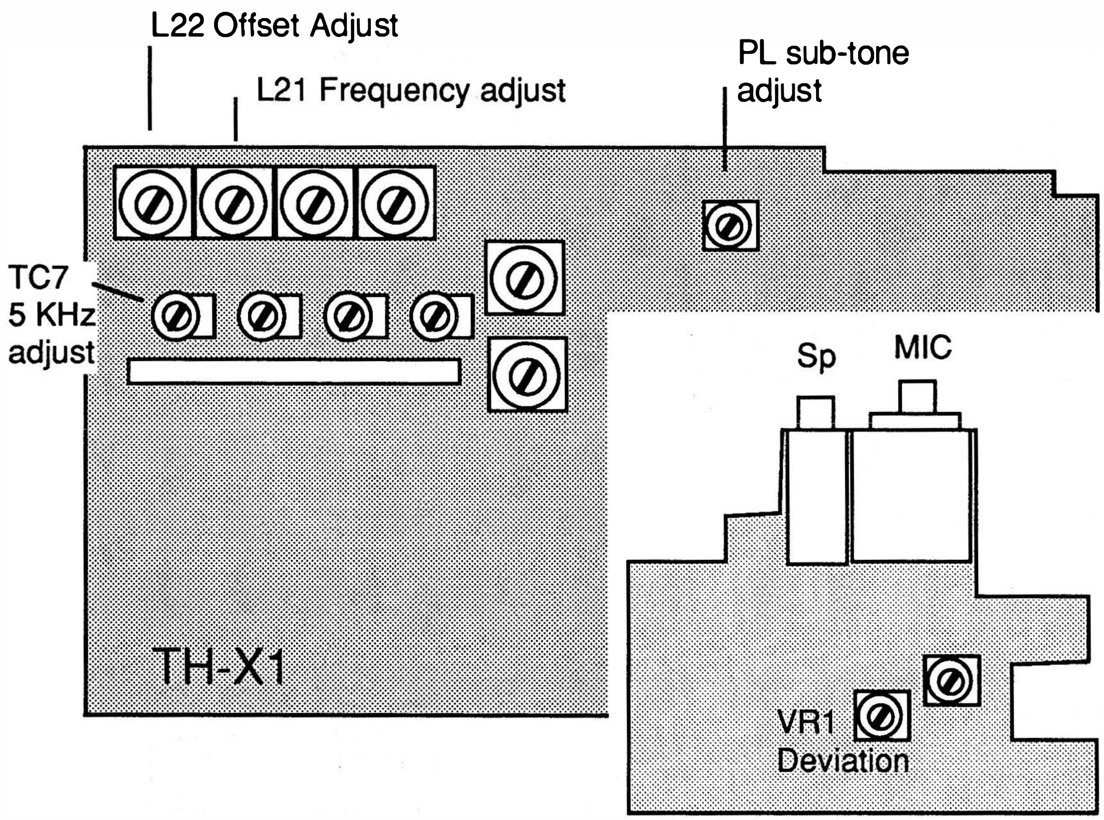


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KENWOOD TH-31 A/BT

ADJUSTMENT CONTROLS

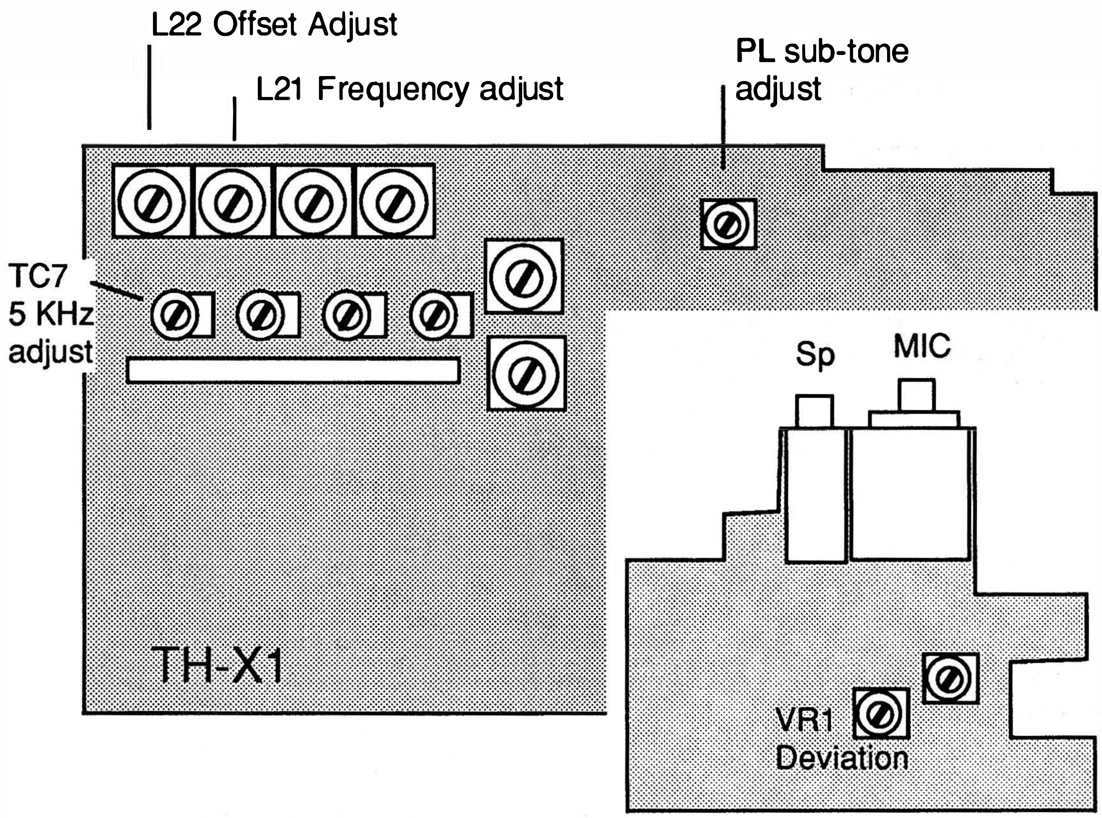




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KENWOOD TH-41 A/BT

ADJUSTMENT CONTROLS

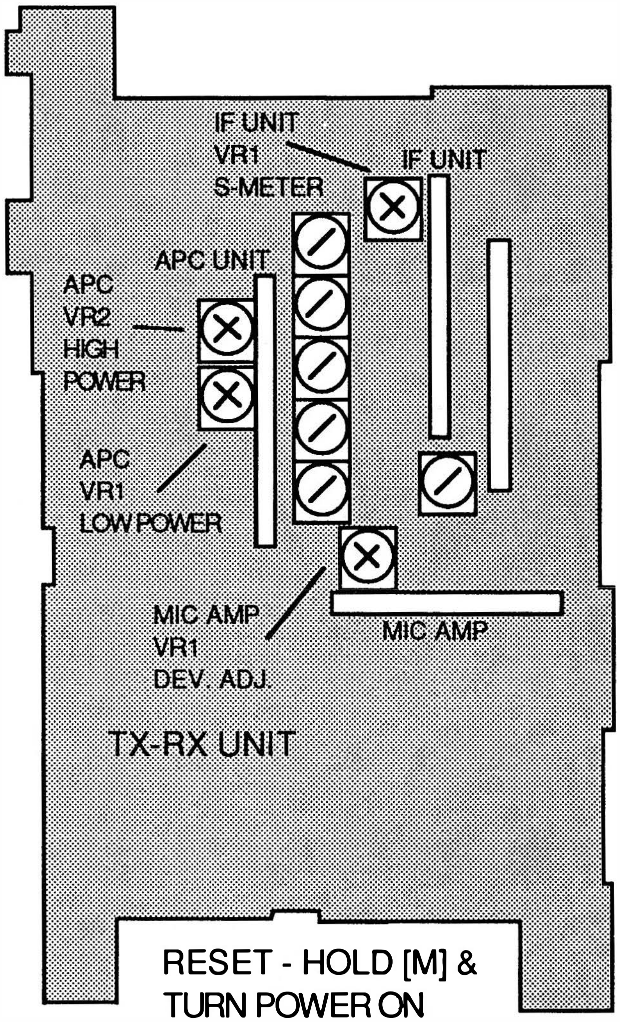



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KENWOOD TH-45A/AT

ADJUSTMENT CONTROLS



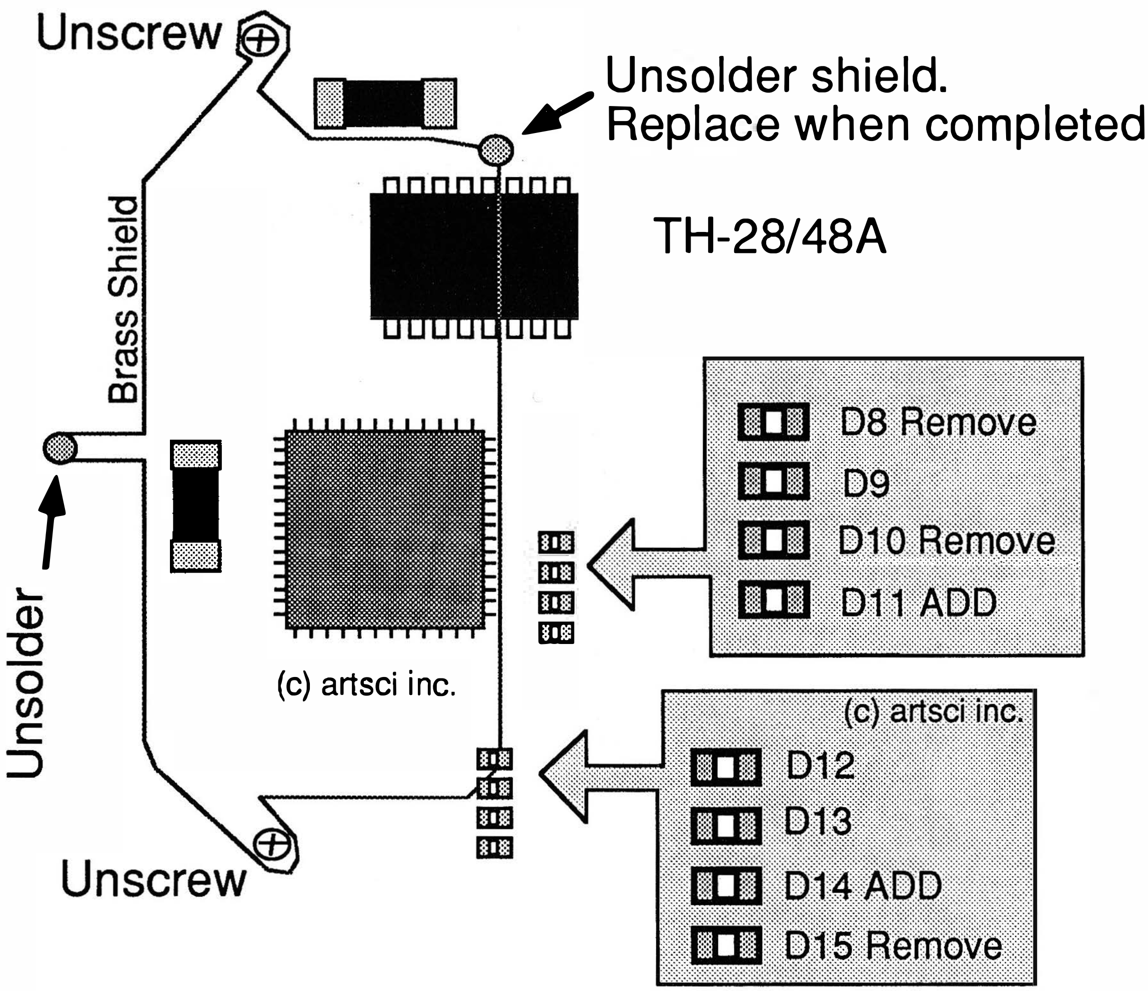
DTMF LEVEL -
VR1 ON SIGNALING UNIT

Caution

KENWOOD TH-48A

EXPANDED RF

1. Disconnect the Power and antenna.
2. Remove case screws and open the radio.
3. Locate Brass Shield.
4. Unsolder the two solder tack point on the shield.
5. Remove the two screws holding the shield.
6. Locate chip diode positions D8.....D15.
7. Remove Diode D8,D10 & D15. (save the diodes)
8. Install Diodes D11 & D14. (used diodes removed in the previous step)
9. Replace the brass shield. (replace the screws and the solder tack points.
10. Reassemble the radio.
11. Reset the microprocessor. (PRESS AND HOLD [F] AND TURN POWER ON)



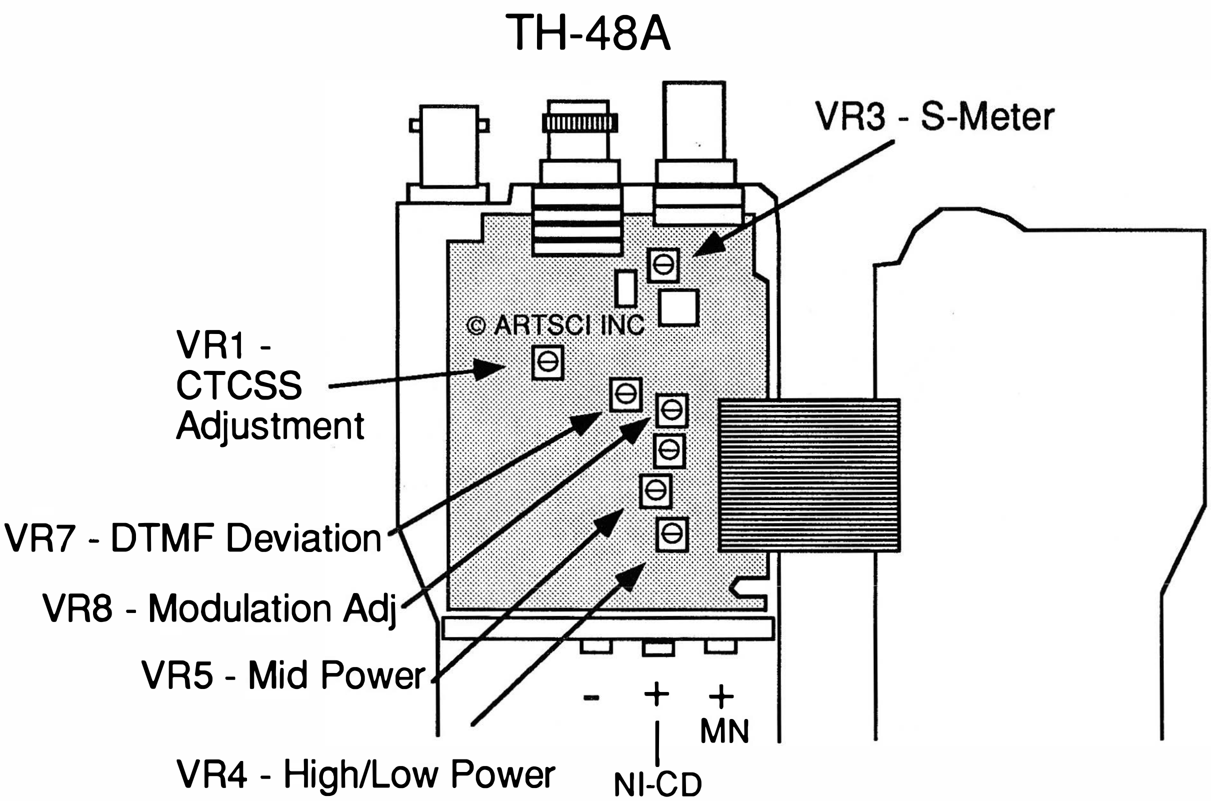
MORE --

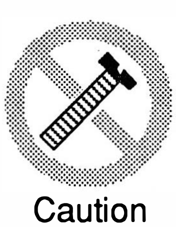


Caution

KENWOOD TH-48A

ALIGNMENT POINTS

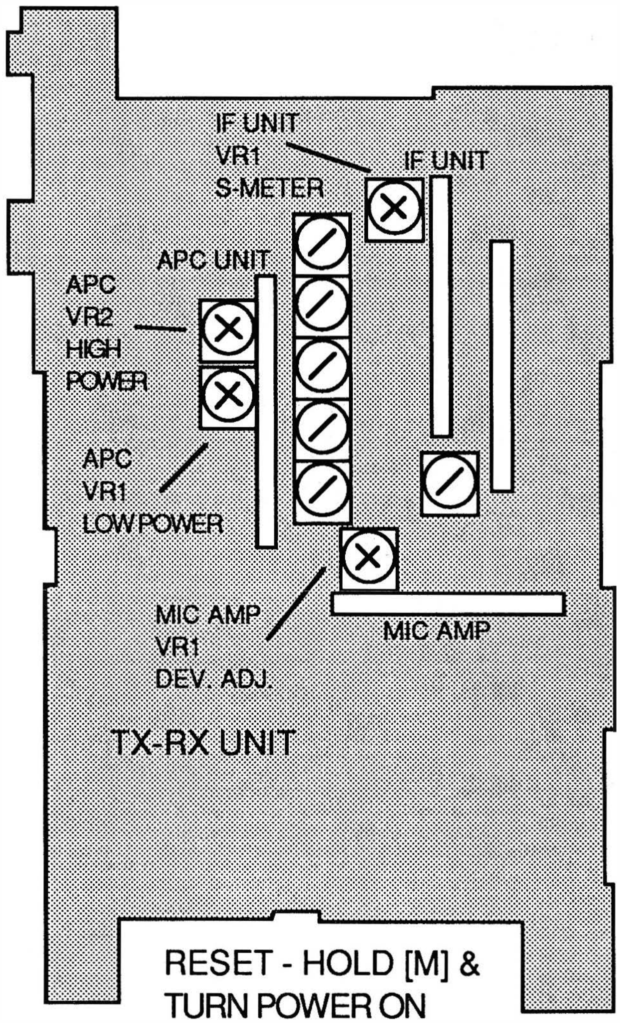




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KENWOOD TH-55A/AT

ADJUSTMENT CONTROLS



DTMF LEVEL -
VR1 ON SIGNALING UNIT

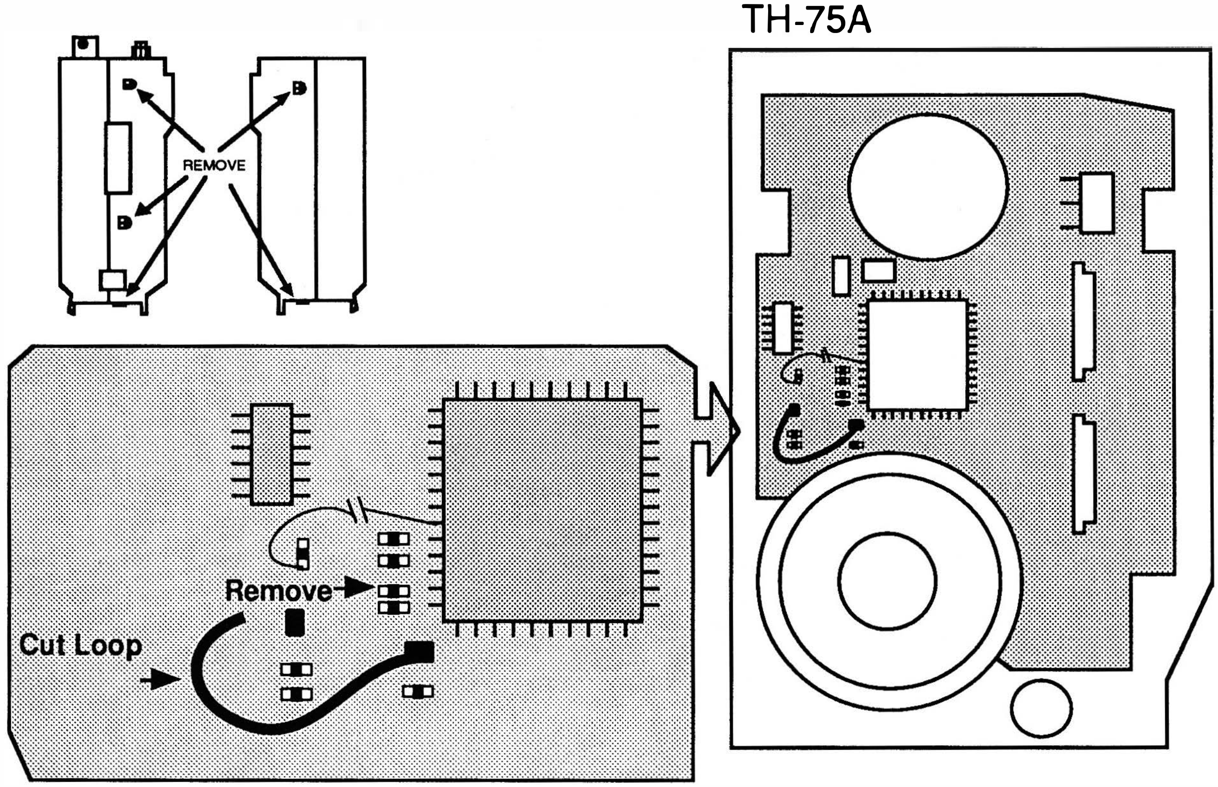


KENWOOD TH-75A

EXPANDED RF

1 Disconnect the battery and antenna.
2. Remove the three case screws and two battery plate screws.
3. Lift front panel from radio. Do not disconnect flex cables.
4. Cut the GREEN JUMPER WIRE, located on left side of the CPU.
5. Remove the diode. (see drawing)
6. Reassemble the radio.
7. RESET the CPU. Press and hold the M Key while turning on the radio.

TH-75A

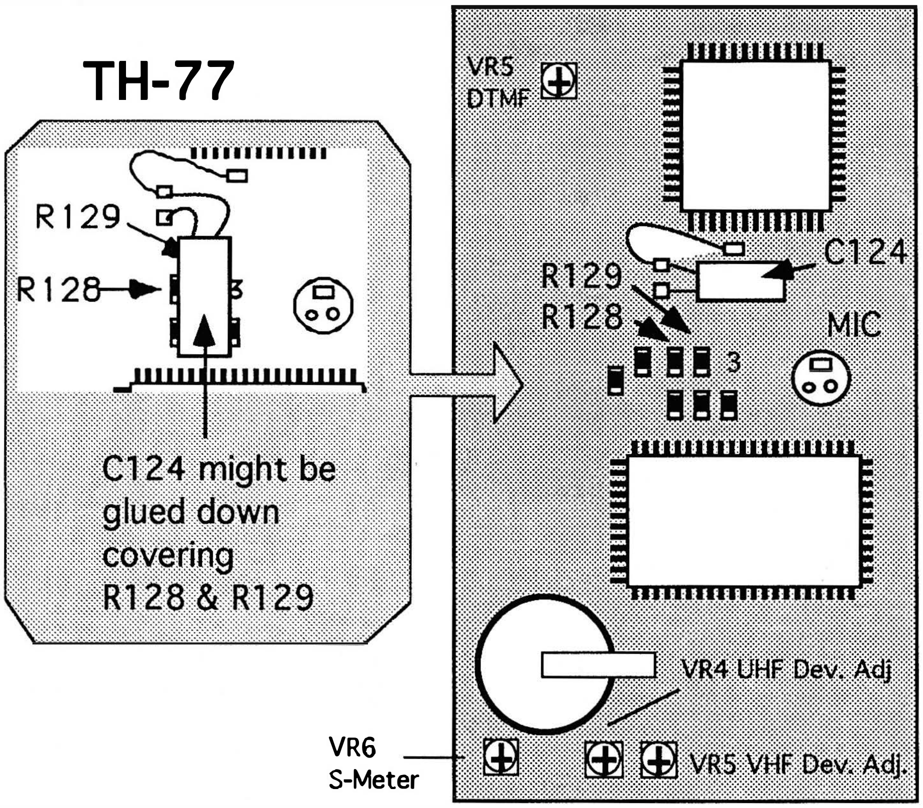



Caution

KENWOOD TH-77A

EXPANDED RF & CROSS BAND REPEATER
AM RECEIVE ON 118-136 MHz

1 Disconnect the battery and antenna.
2. Remove the three case screws and two battery plate screws.
3. Lift front panel from radio. Do not disconnect flex cables.
4. Remove chip resistor R128 and R129. Capacitor C124 may be glued down over these Resistors. You may wish to unsolder the capacitor to avoid tearing the flex board foil traces.
5. Reassemble the radio.
6. RESET the CPU.



AM sensitivity is typically less than 1uV for 10db S+N/N.

CROSS BAND OPERATING PROCEDURES

Turn on /off the Repeater mode : Press and hold the [SUB UP] key and turn the power on.



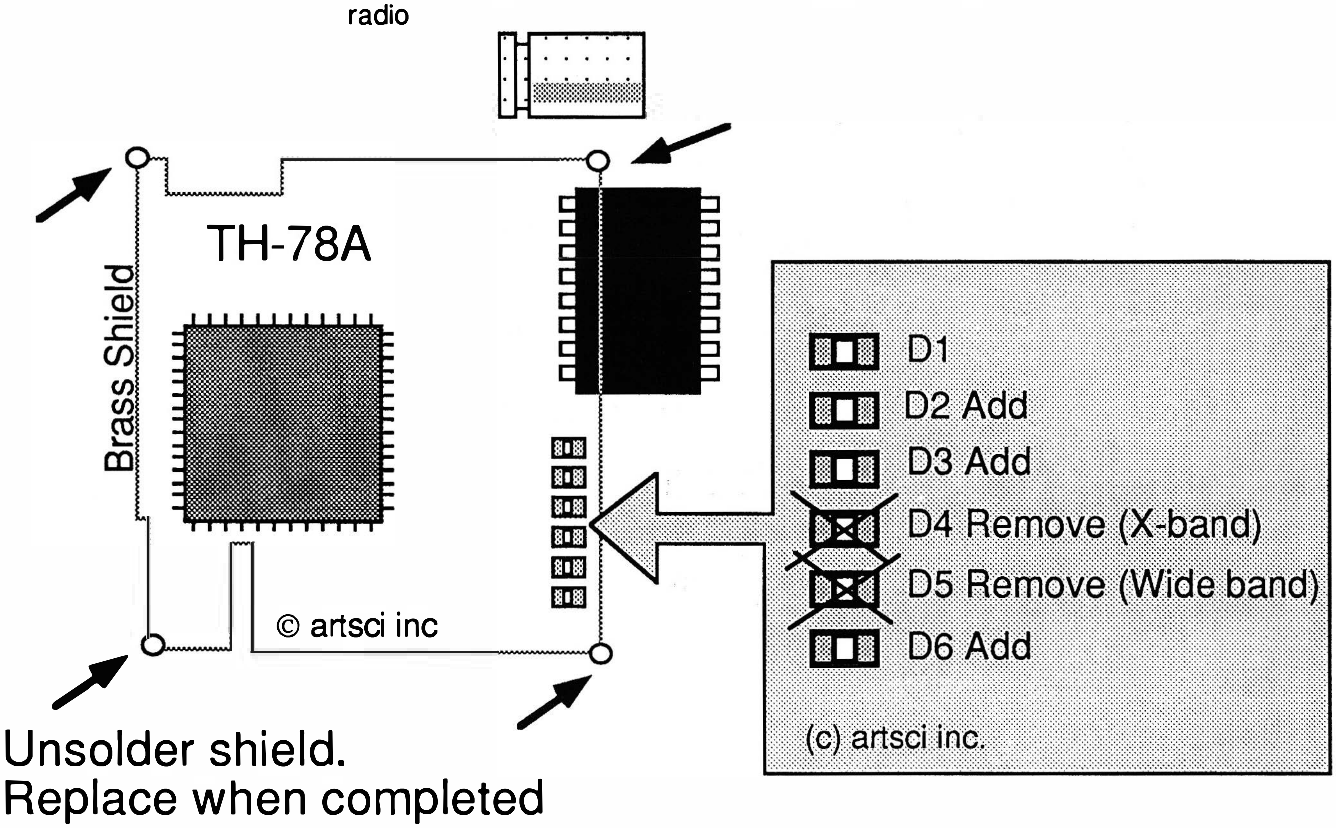
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KENWOOD TH-78A

EXPANDED RF

1 Disconnect the battery and antenna.
2. Remove 4 screws (3 on back & 1 on left side) and open the case.
3. Locate and remove the Brass Shield. (4 solder points)
4. Locate Diode position D1......D6.
5. Install a chip diode in position D2, D3 & D6. (Already present in USA versions)
6. Remove chip diode D5. (Expanded RF)
7. Remove chiip diode D4. (Cross band mod)
8. Resolder Brass Shield.
9. Reassemble the radio. (Be careful of the small O-rings sealing the two LED's)
10. Reset the Microprocessor. (see user manual).

NOTE: TO SELECT 300 & 800 MHZ. IN 440: PRESS [F] KEY FOR 2 SECONDS THEN [BAND].
TO TURN ON/OFF CROSS BAND REPEATER FUNCTION: PRESS [F] & [0].
TO CLONE RADIOS: Press & hold [F] [0] [Power] for 2 seconds. Press PTT on master radio



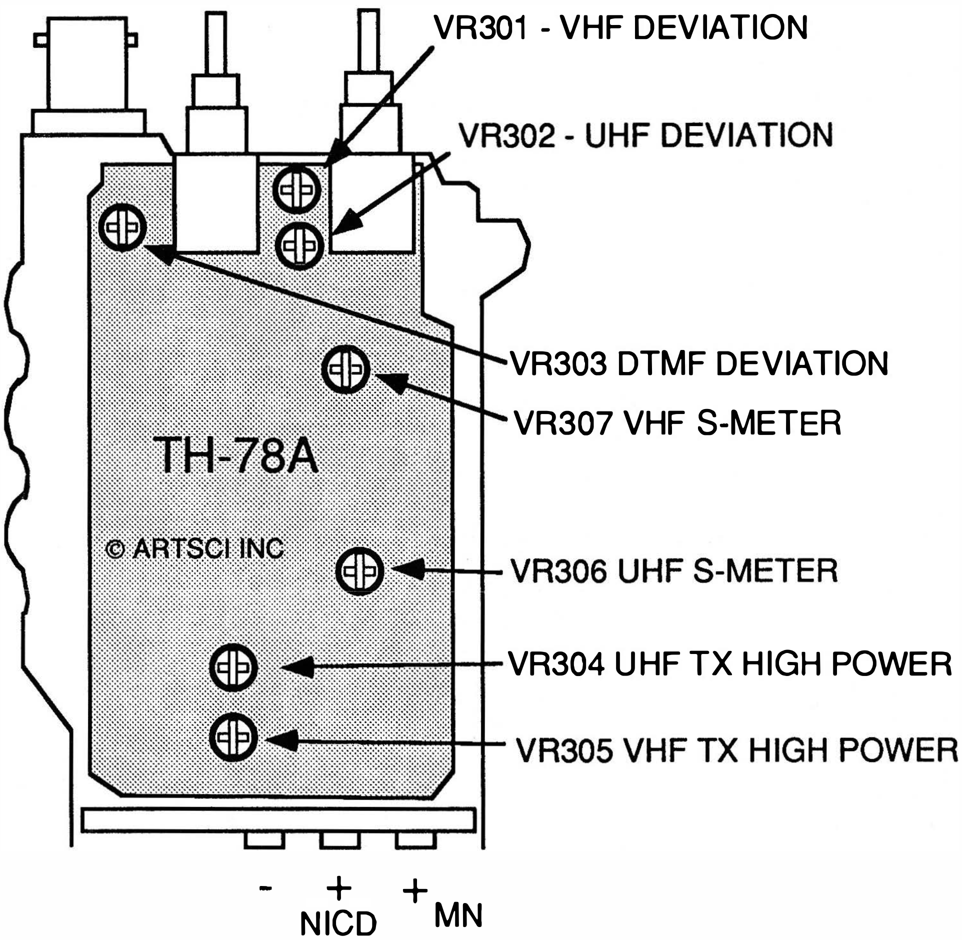
MORE ---



Caution

KENWOOD TH-78A

ALIGNMENT POINTS

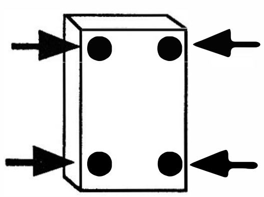




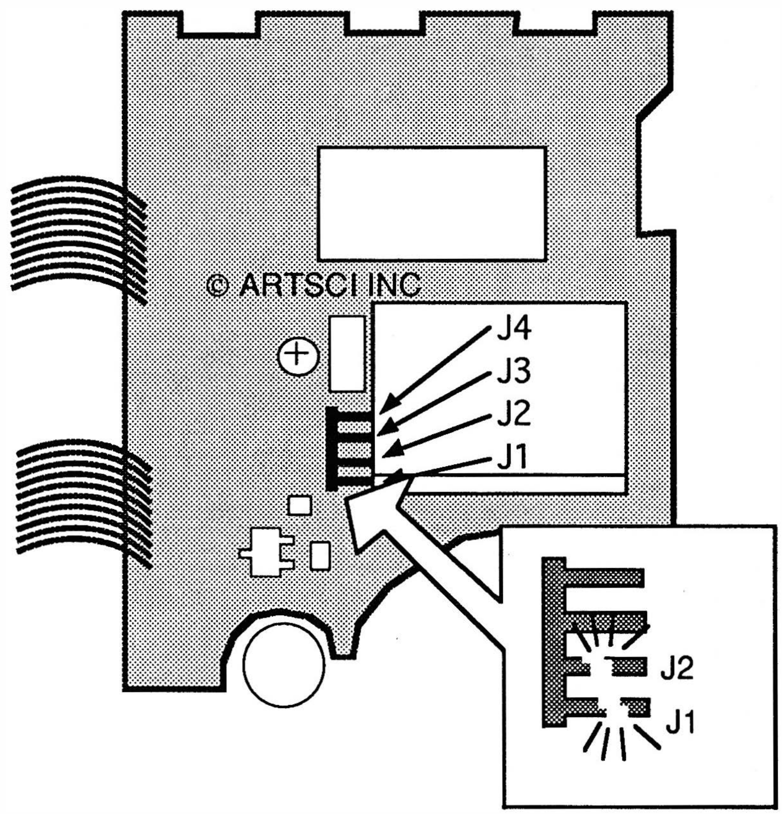
KENWOOD TH-215

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the 4 screws from the back panel.
3. Carefully lift the front panel from the radio. Do not disconnect the flex cables.
4. CUT Jumpers J1 and J2.
5. Reassemble the radio.
6. RESET the CPU. (Press and hold [F] & [ENTER] and turn power on)



Remove
4 Screws



MORE ---

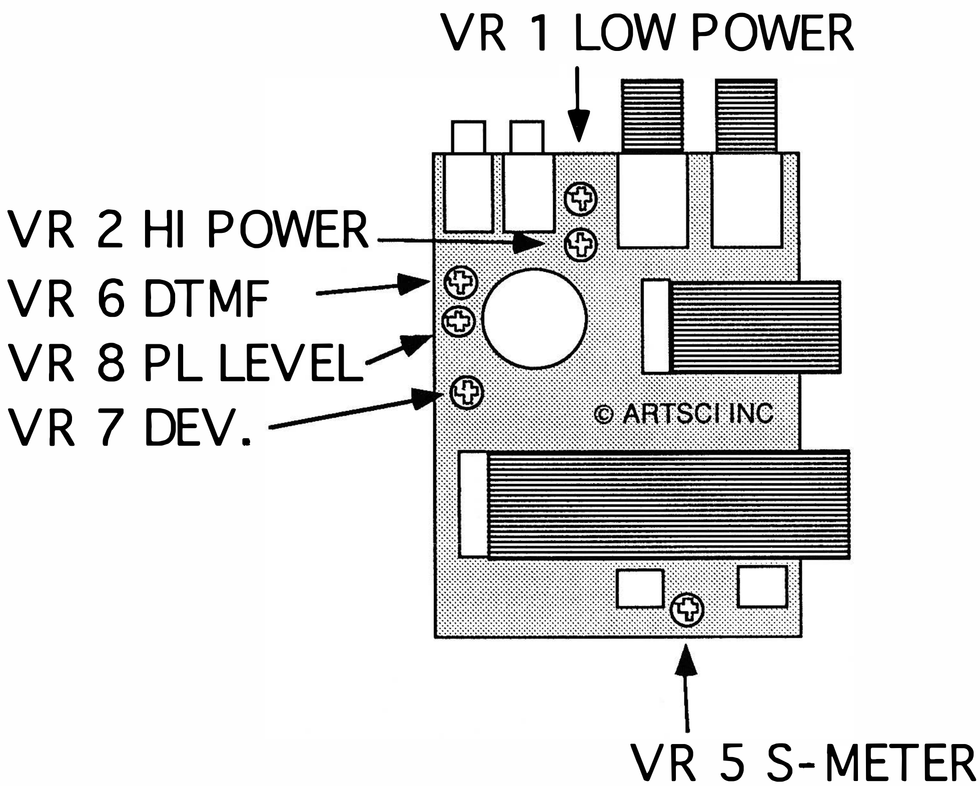


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KENWOOD TH-215

ALIGNMENT CONTROLS

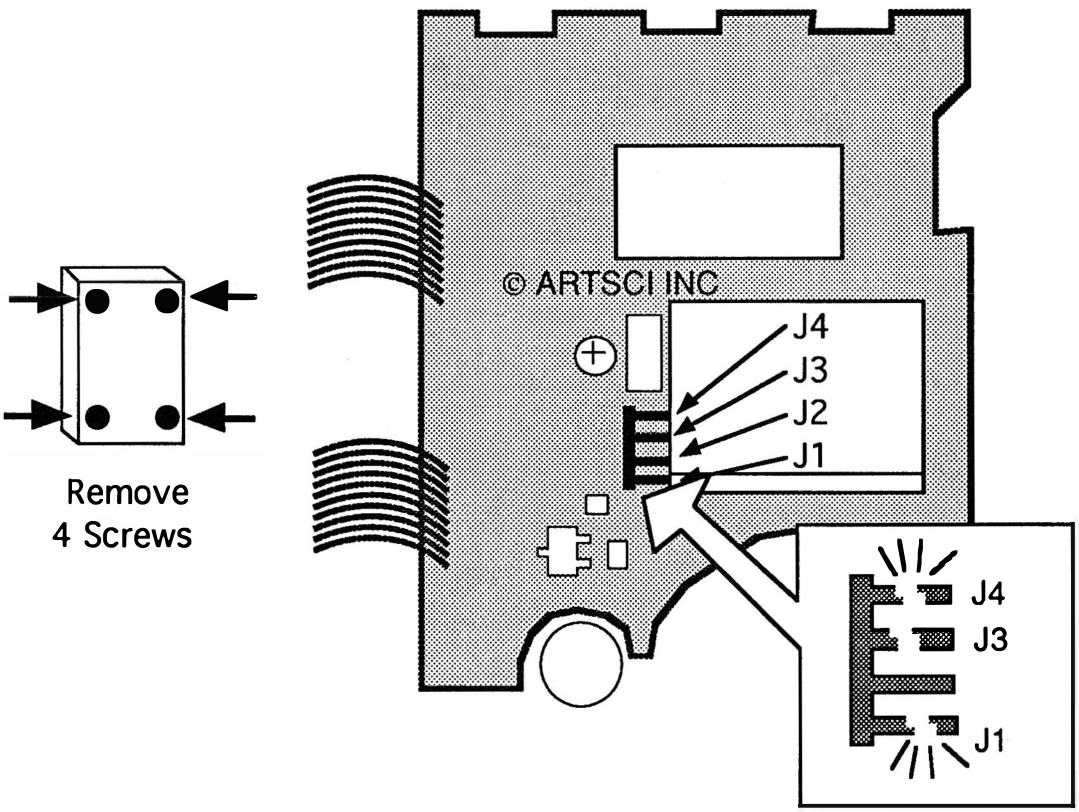




KENWOOD TH-315

EXTENDED RF

1. Remove battery and antenna.
2. Remove the screws holding the radio together.
3. Locate the Digital Circuit board (A02-076X-05)
4. Cut Jumpers 1, 3 and 4
5. Reassemble the radio.
6. Reset the microprocessor.(Press and hold [F] & [ENTER] and turn power on)



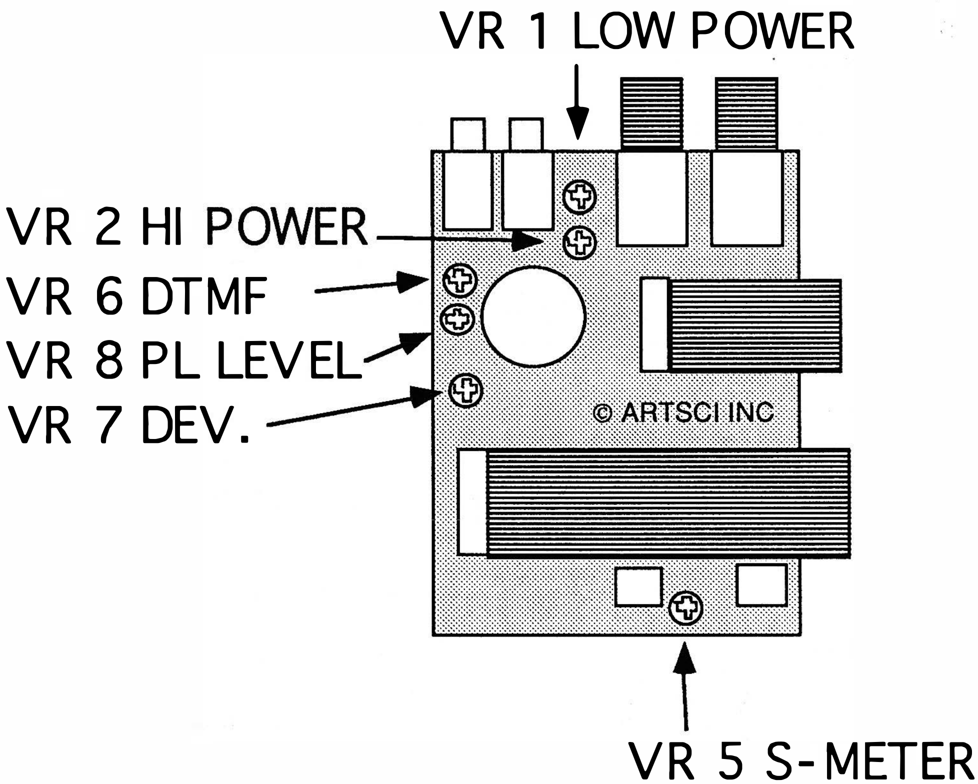
Range : 215.000 - 229.995 MHz

MORE ---



KENWOOD TH-315

ALIGNMENT CONTROLS



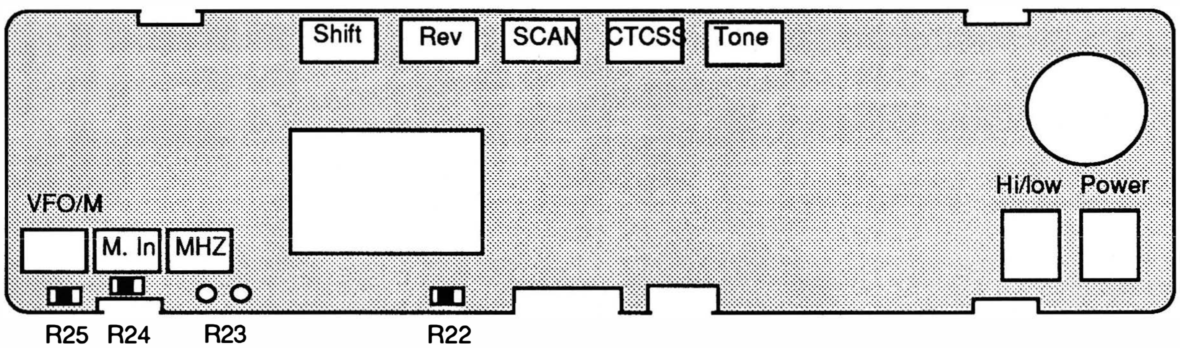
Caution

KENWOOD TM-221

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom covers.
3. Locate the control unit (X53-3040-XX). It is the board closest to the front.
4. Remove R25 and Place it in the position of R24.
5. Reassemble the radio.
6. RESET the CPU. (Press and hold [VFO/M] & [M.IN] and turn power on)

TM-X21



TX Range 142 MHz - 154 MHz

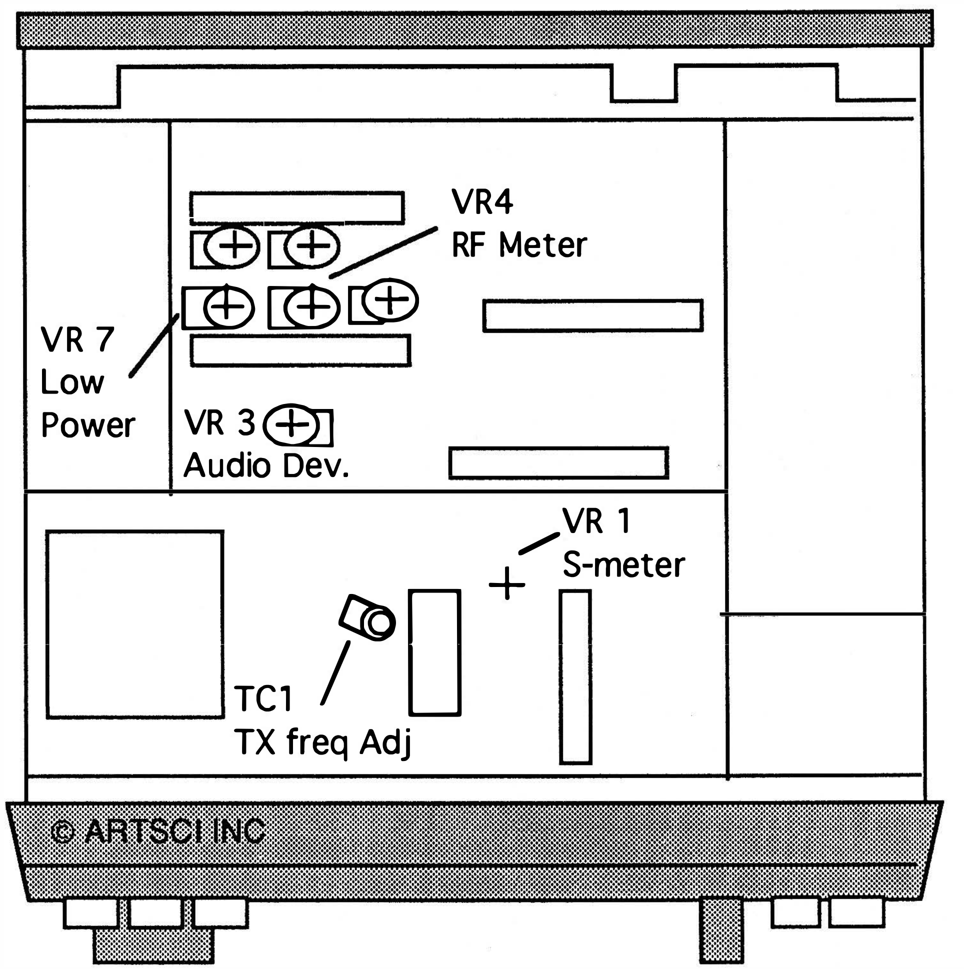
MORE ---



Caution

KENWOOD TM-221

ALIGNMENT CONTROLS



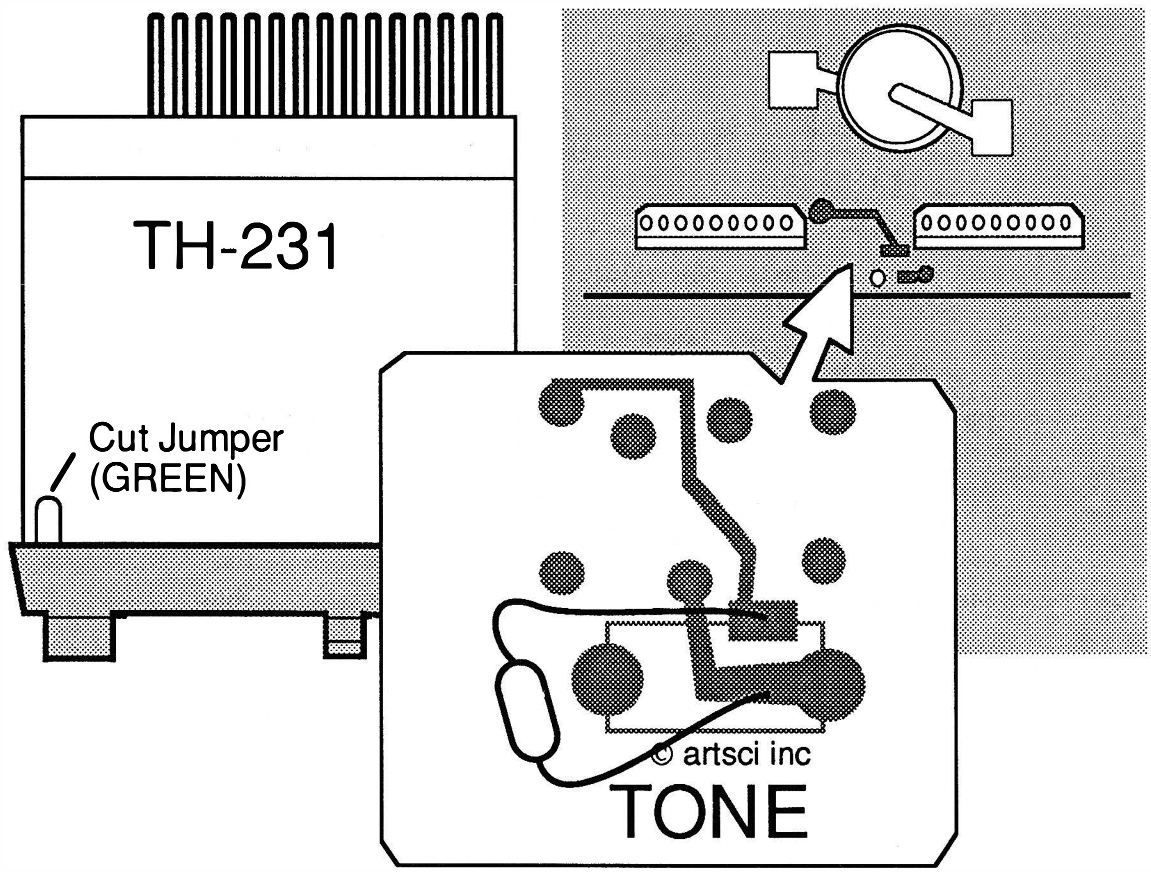


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KENWOOD TM-231A

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom cover.
3. Remove all knobs from the front panel.
4. Remove the nut from the mic jack and the nut from the channel switch.
5. Remove four screws holding the front panel.
6. Remove the three screws from the control board.
7. Locate the green jumper wire sticking out the front panel, behind the VFO button
8. Cut the green jumper and tape the edges to prevent them from shorting.
9. Install diode D209 Part # MA141A on control board X57-3310-11.
10. Reassemble the radio
11. Reset the microprocessor. (Press and hold [MR] while turning on the power)



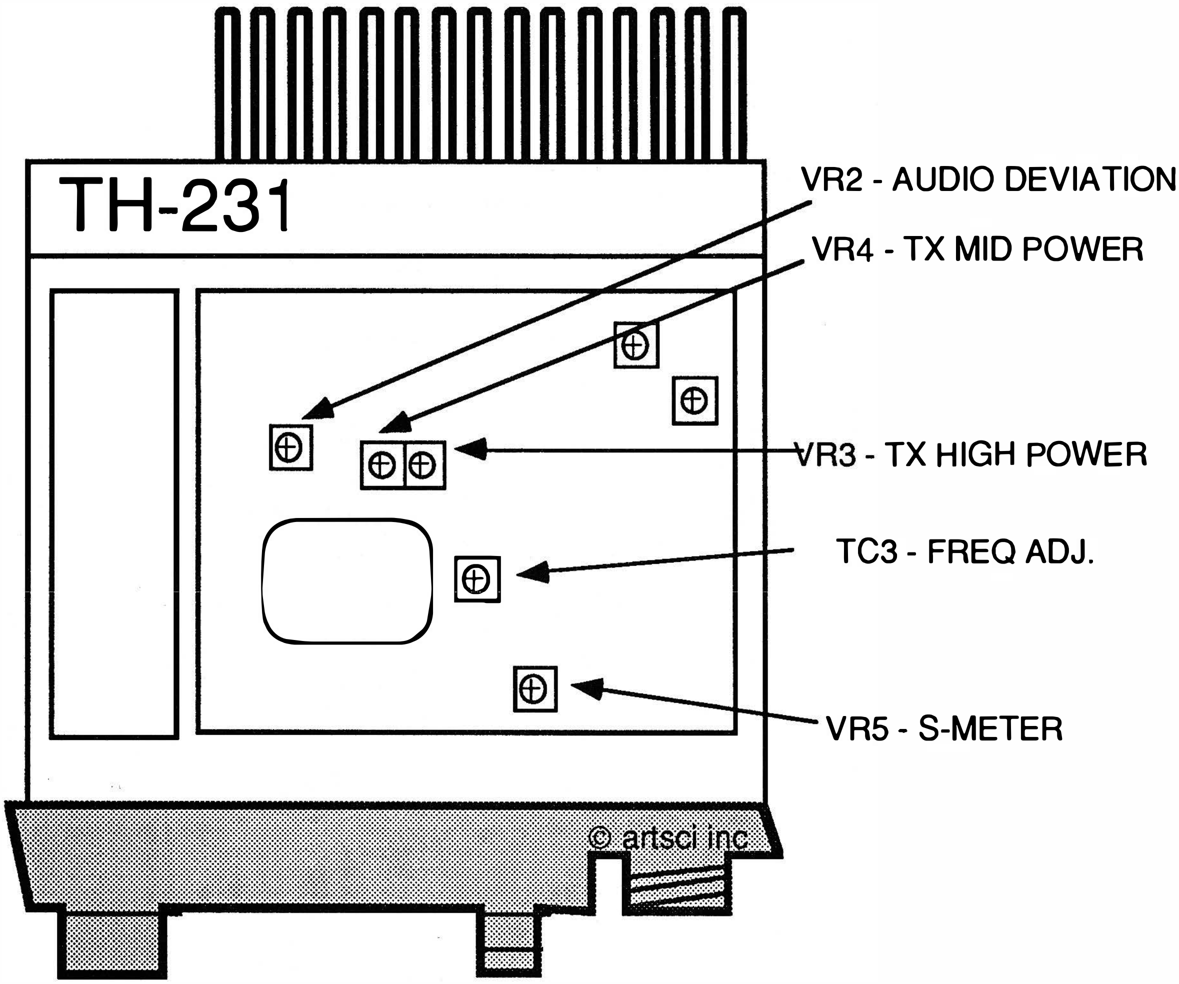
MORE ---



Caution

KENWOOD TM-231A

ALIGNMENT CONTROLS

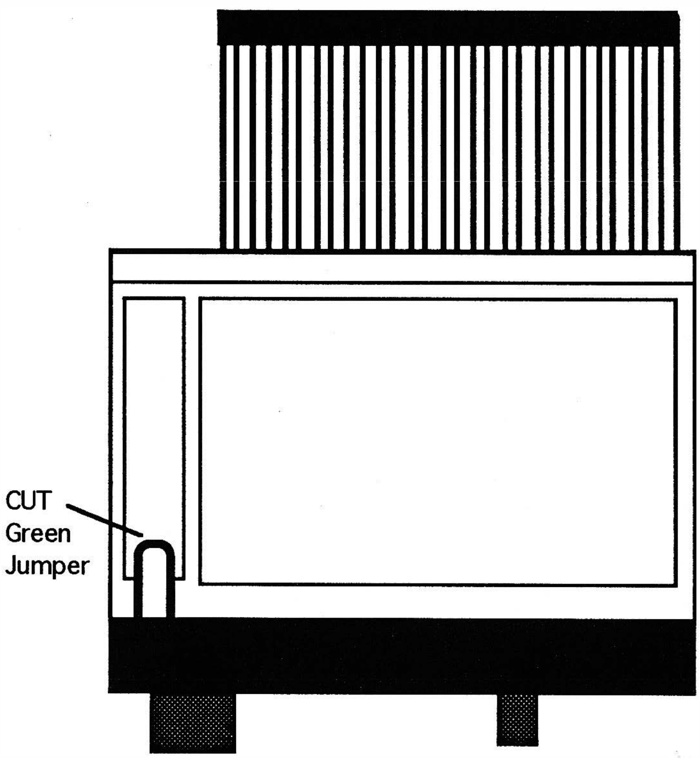


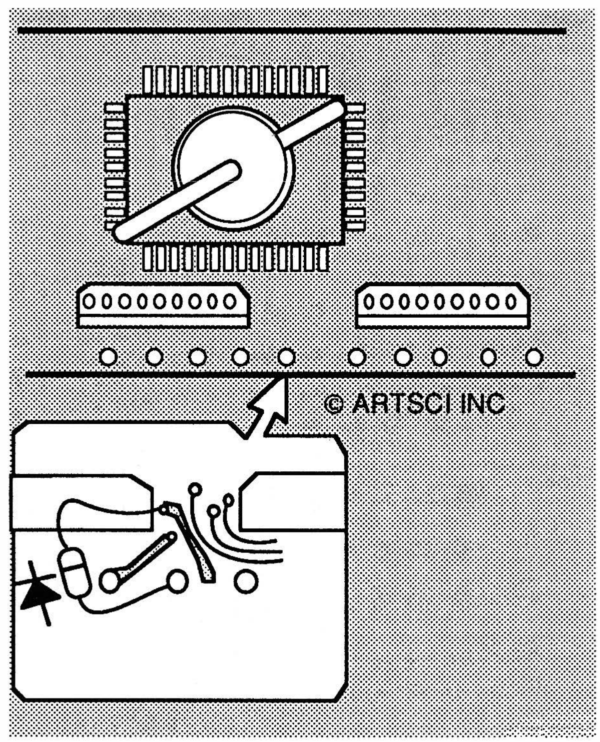


KENWOOD TM-241A

EXPANDED RF M/C
136 - 174 MHz RX/TX

1 Disconnect the power and antenna.
2. Remove the top and bottom cover.
3. Remove all knobs from the front panel.
4. Remove the nut from the mic jack and the nut from the channel switch.
5. Remove four screws holding the front panel.
6. Remove the three screws from the control board.
7. Locate the green jumper wire on the control board.
8. Cut the green jumper and tape the edges to prevent them from shorting.
9. Install chip diode D209 on control board Part # MA141A
   The control board is located on the front panel (Control knobs must be removed.)
10. Reassemble the radio
11. Reset the microprocessor (Press and hold [MR] while turning on the power)





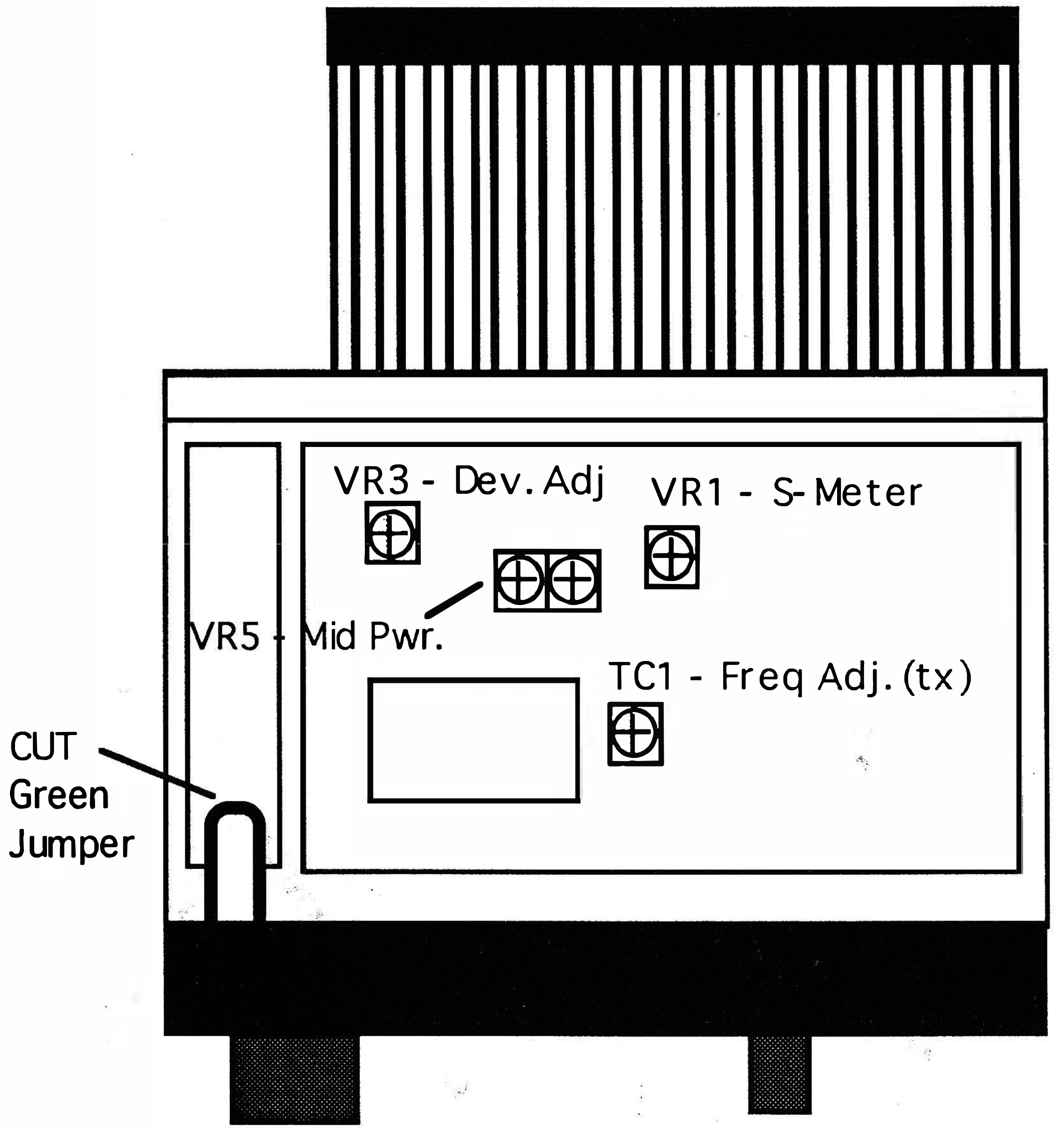
MORE ---


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KENWOOD TM-241A

ALIGNMENT CONTROLS





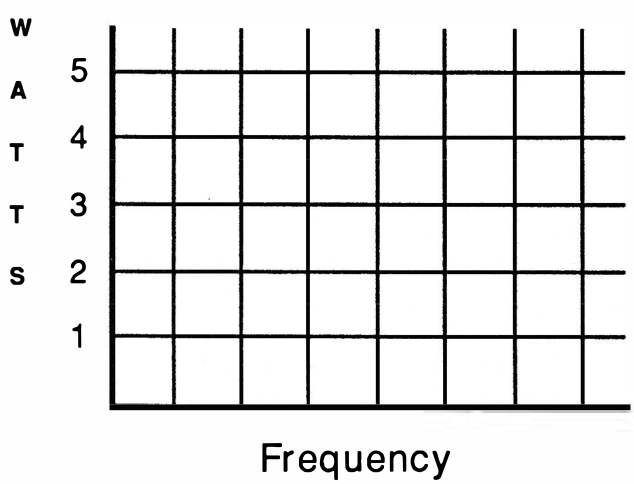
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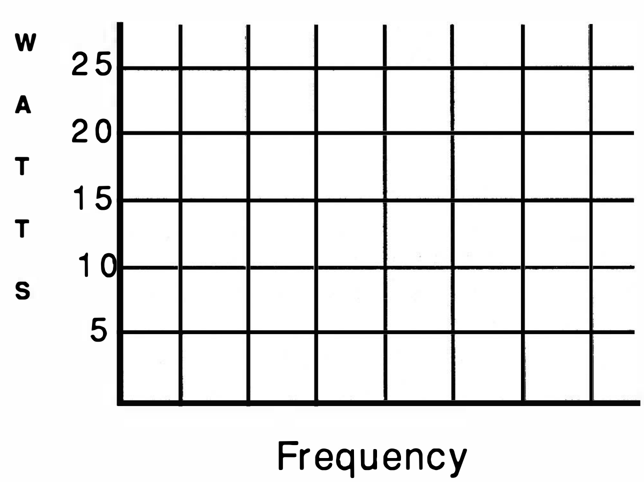
Performance Report

Radio ______________________________ Date ____________

Owner : Name ____
Address ______________________________________
City ____________________ St. ______ Zip ________
Phone ( ) - ______________________________________

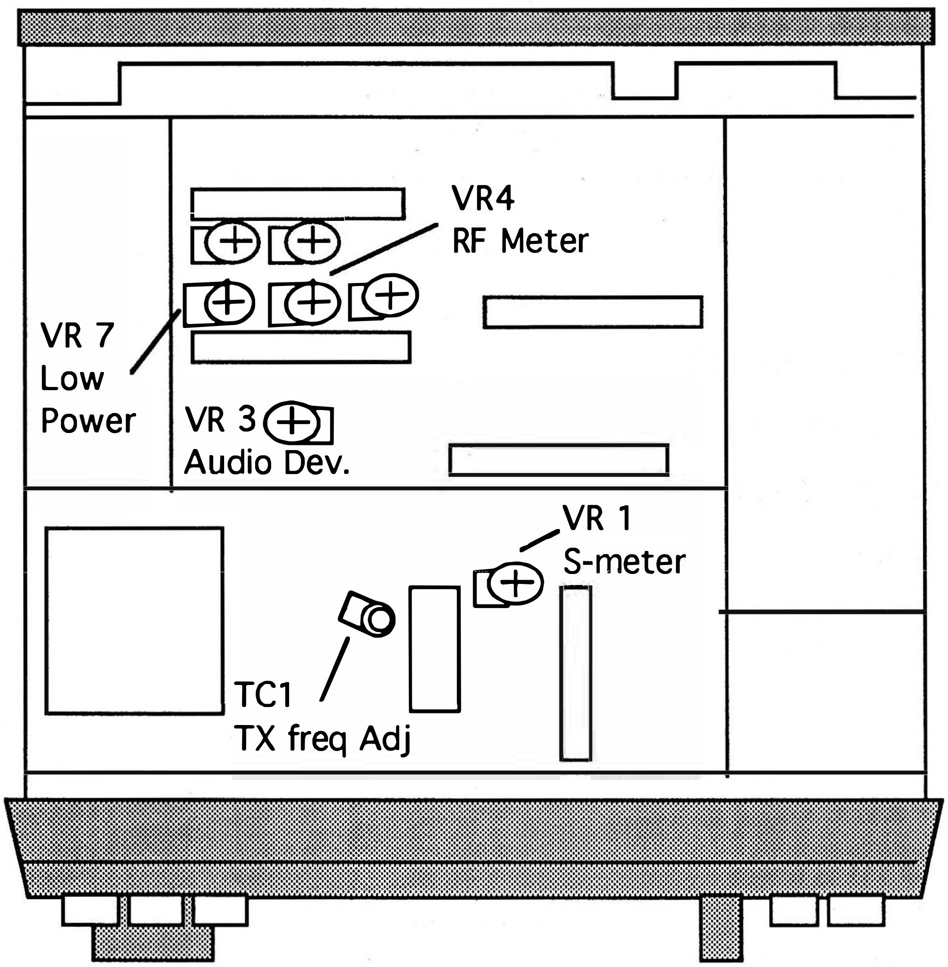
Description	Before	After
Power out (Low)	________ Watts	________ Watts
Power out (High)	________ Watts	________ Watts
Frequency Error (Simplex)	________ Hz	________ Hz
Frequency Error (Offset)	________ Hz	________ Hz
Receive Sensitivity (Mid-band)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
PL Deviation	________ Hz	________ Hz
DTMF Deviation	________ KHz	________ KHz
Audio Deviation	________ KHz	________ KHz
Lowest usable Freq @ .5 Pwr	________ MHz	________ MHz
Highest usable Freq @ .5 Pwr	________ MHz	________ MHz





KENWOOD TM-321A

ADJUSTMENT CONTROLS





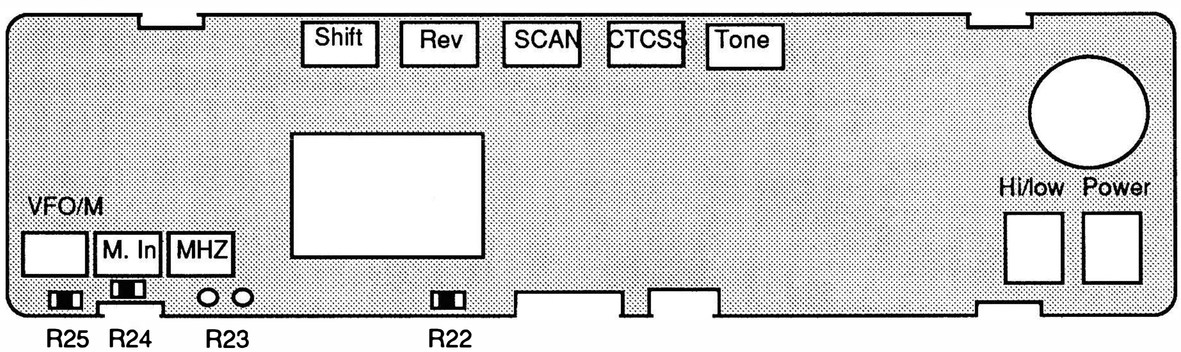
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KENWOOD TM-421A

EXTENDED RF

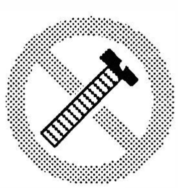
1. Remove power and antenna.
2. Remove the top and bottom covers
3. Remove the channel knob
4. Remove the microphone ring.
5. Remove the volume and squelch knobs
6. Remove the front panel from the unit.
7. Remove the front control unit from the chassis.
8. Locate component side of the Control unit circuit board.
9. Locate chip Resistor R-25.
10. Remove R-25 and place it in the empty position R-23.
11. Remove R-22.
12. Reassemble the radio.
13. Reset the microprocessor.(Press and hold [MR] while turning on the power)

TM-X21



RESET : Press and hold [VFO/M] and [M.IN] and turn power on.

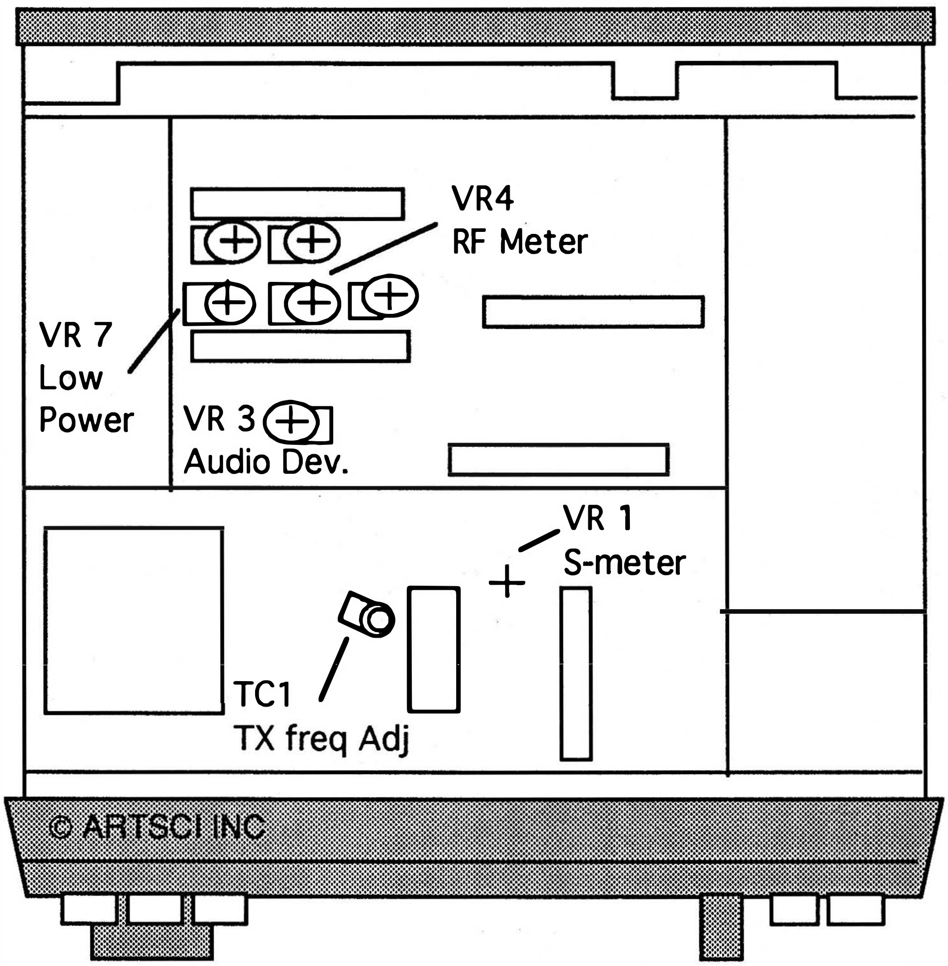
MORE ---



Caution

KENWOOD TM-421A

ALIGNMENT CONTROLS



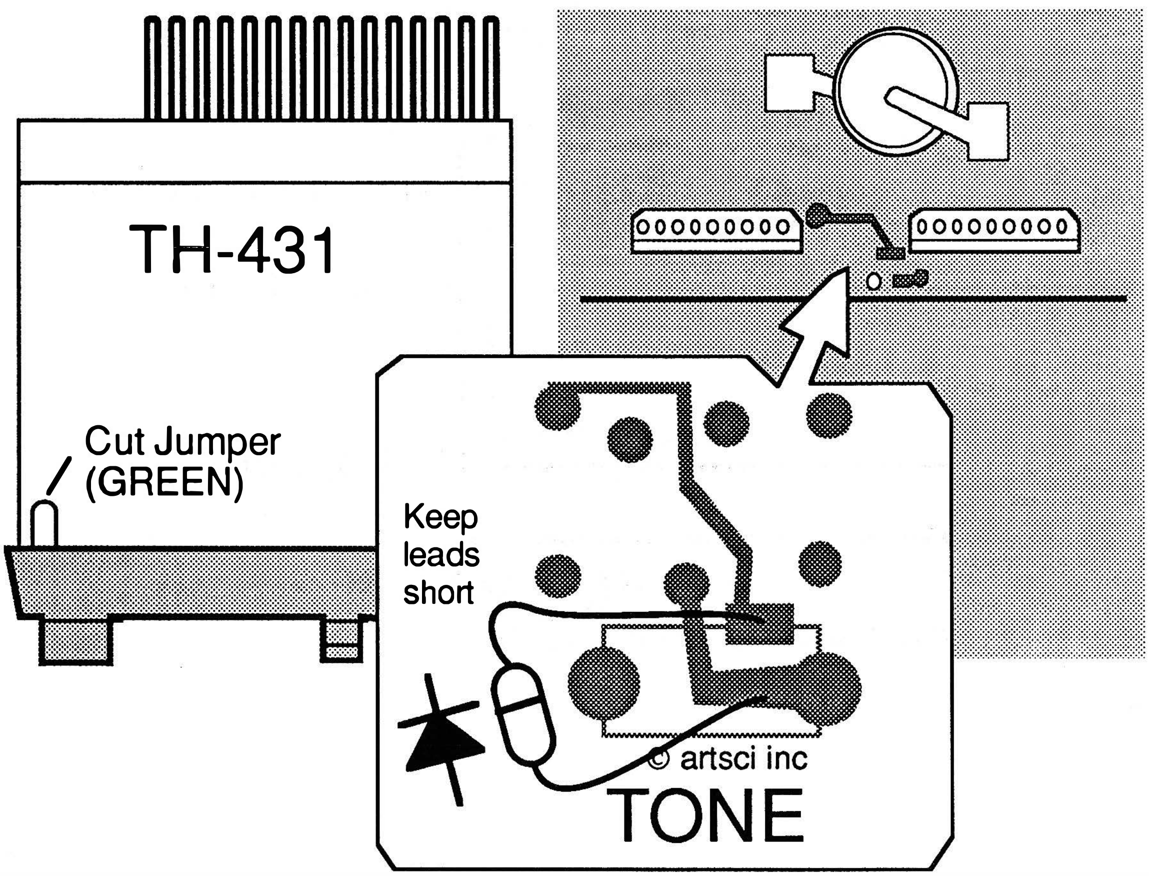


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KENWOOD TM-431A

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom cover.
3. Remove all knobs from front panel.
4. Remove the nut from the mic jack and the nut from the channel switch.
5. Remove four screws holding the front panel.
6. Remove the three screws from the control board.
7. Locate the green jumper wire sticking out the front panel, behind the VFO Button.
8. Cut the green jumper and tape the edges to prevent them from shorting.
9. Install diode D209 Part # MA141A on control board or use a 1N914 as shown.
10. Reassemble the radio
11. Reset the microprocessor. (Press and hold [MR] while turning on the power)

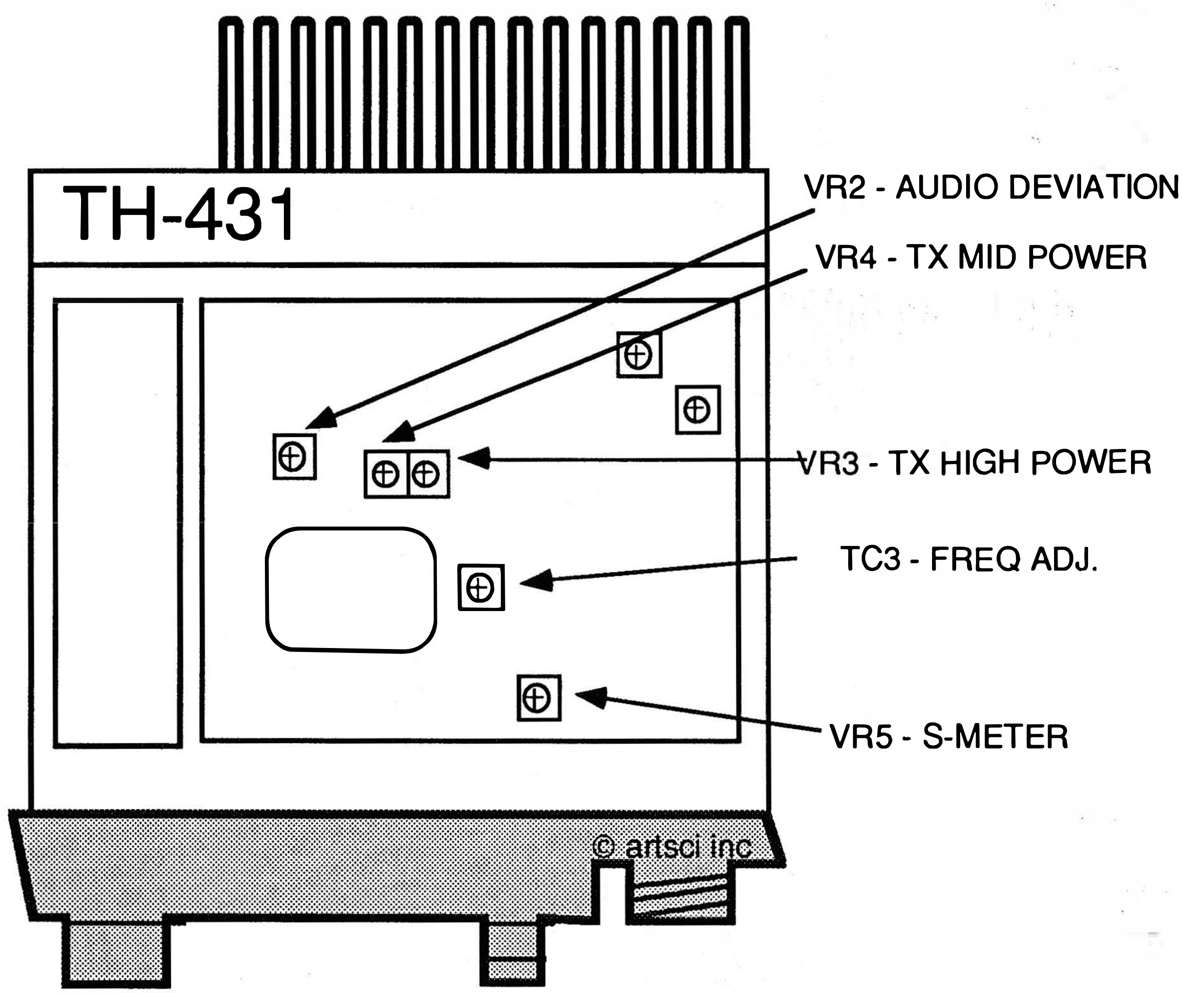


MORE ---



KENWOOD TM-431A

ALIGNMENT CONTROLS

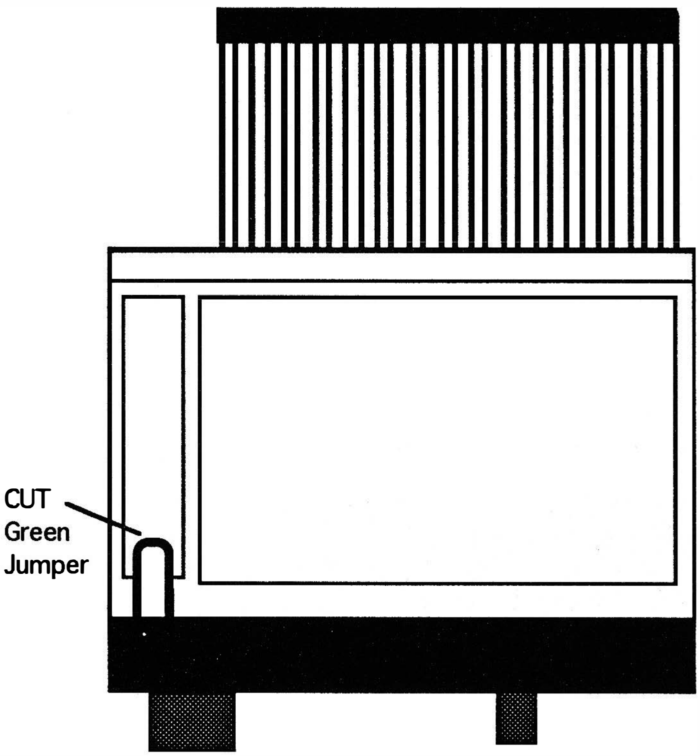


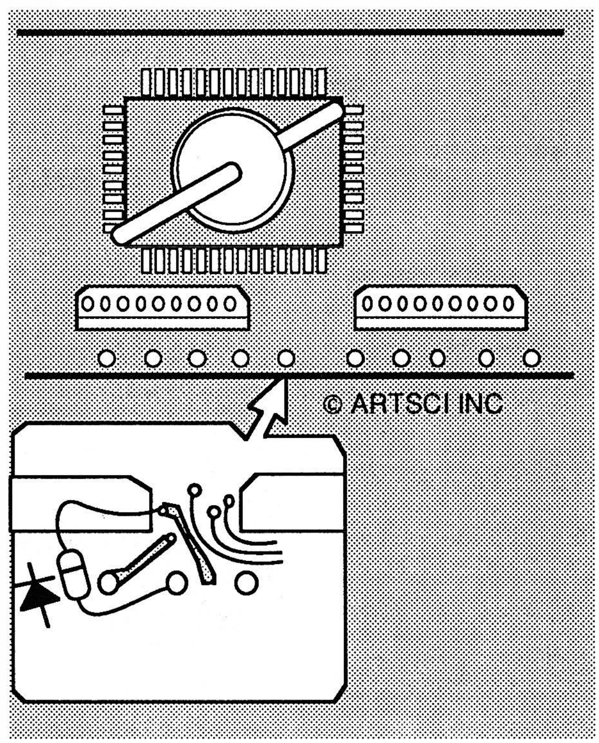


KENWOOD TM-441A

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom cover.
3. Remove all knobs from front panel.
4. Remove the nut from the mic jack and the nut from the channel switch.
5. Remove four screws holding the front panel.
6. Remove the three screws from the control board.
7. Locate the green jumper wire on the control board.
8. Cut the green jumper and tape the edges to prevent them from shorting.
9. Install chip diode D209 on control board Part # MA141A.
The control board is located on the front panel (Control knobs must be removed.)
10. Reassemble the radio
11. Reset the microprocessor. (Press and hold [MR] while turning on the power)



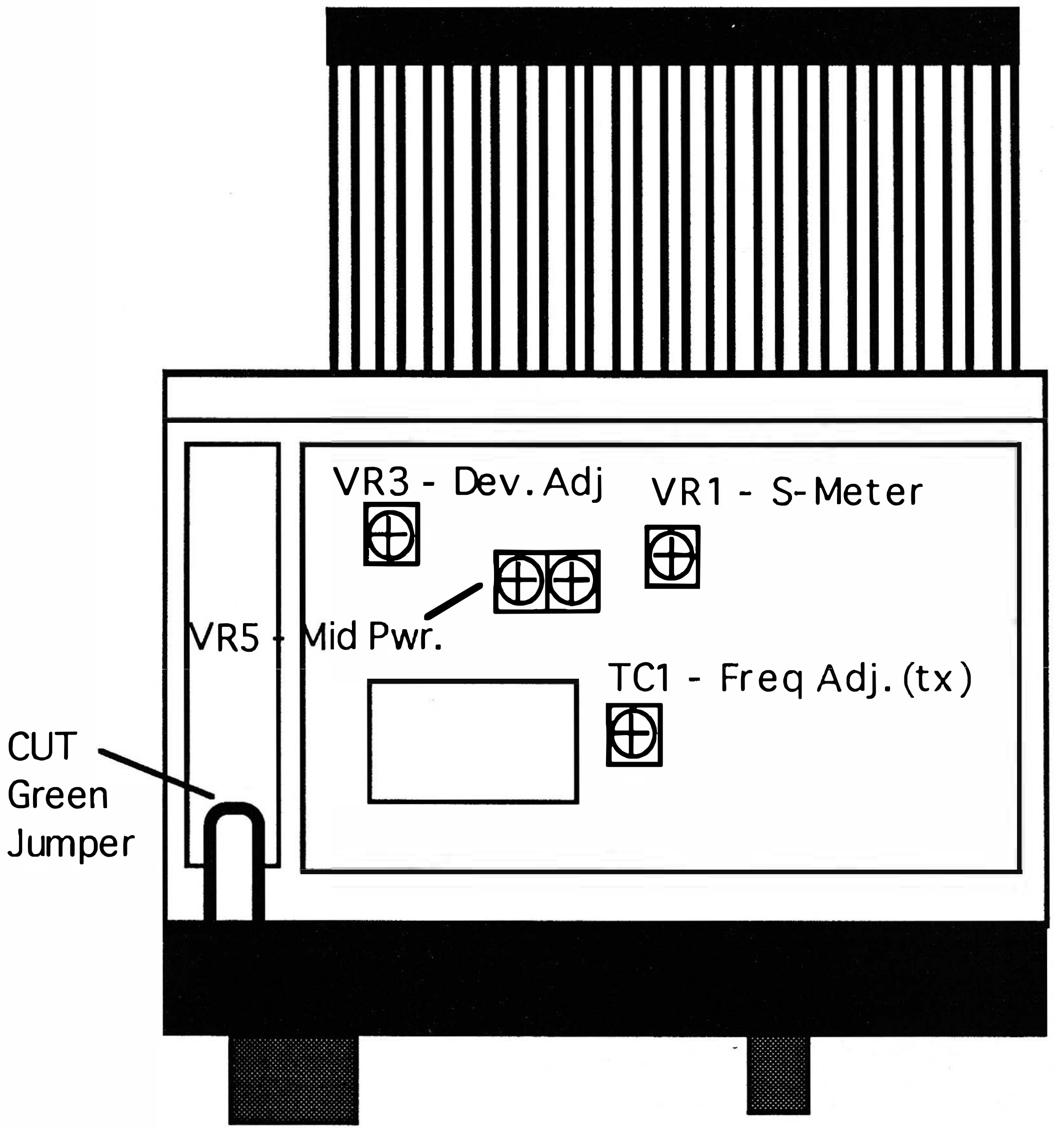


MORE ---



KENWOOD TM-441A

ALIGNMENT CONTROLS

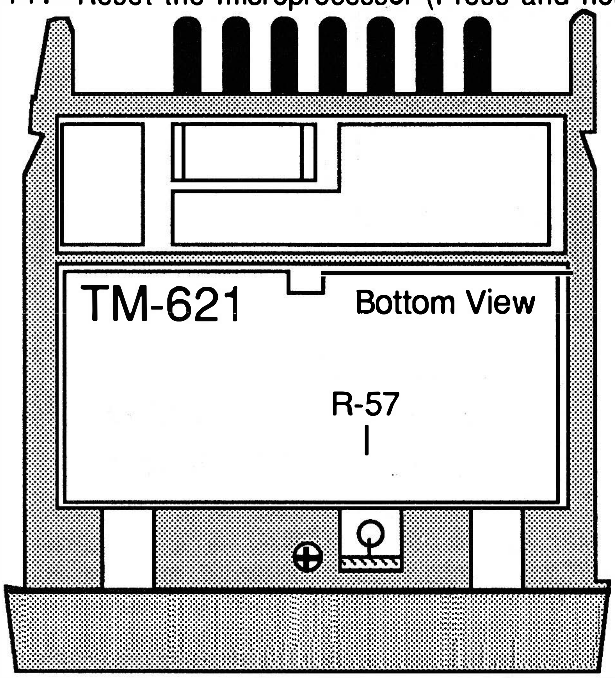


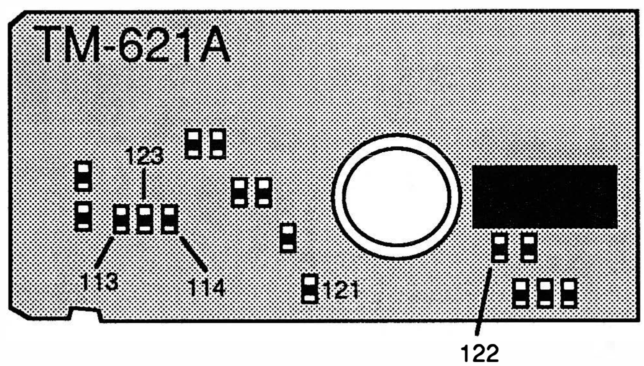


KENWOOD TM-621A

EXPANDED RF / CROSS BAND REPEATER

1 Disconnect the power and antenna.
2. Remove the top and bottom covers.
3. Locate and cut R57 on Control board. (Bottom side of radio)
4. Remove the silver colored screws from the front panel.
5. Carefully pull the front panel away from the body of the transceiver.
6. Locate chip resistor R113 and R114 on the Control board. (inside front panel)
7. Remove the chip resistor located between resistors R113 & R114. It is labeled R123.
8. Remove chip resistor R121 (cross band repeater mod)
9. Remove R122 (disable 3 minute time out timer).
10. Reassemble radio.
11. Reset the microprocessor (Press and hold [F] while turning power on).



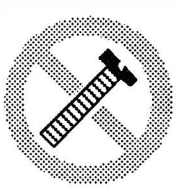


CROSS BAND OPERATING PROCEDURES

The TM-621 will receive a signal on one band and will automatically retransmit it on the other band. Each band can contain shift information.

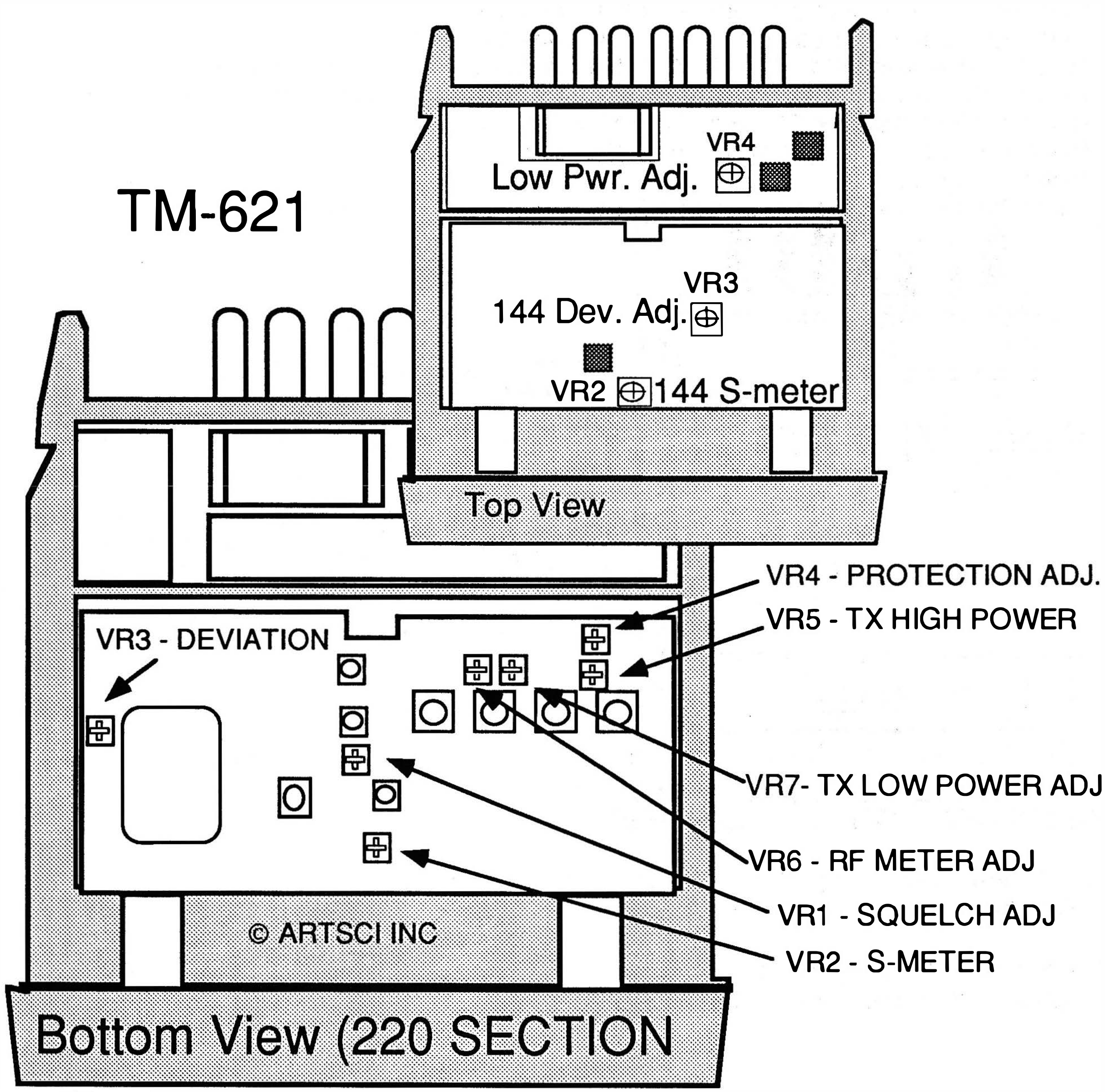
Turn on / off the Repeater mode : Press F and then press A.B.C. Key. Three dots should appear in the display when the mode is on.

MORE ---



KENWOOD TM-621A

ALIGNMENT CONTROLS



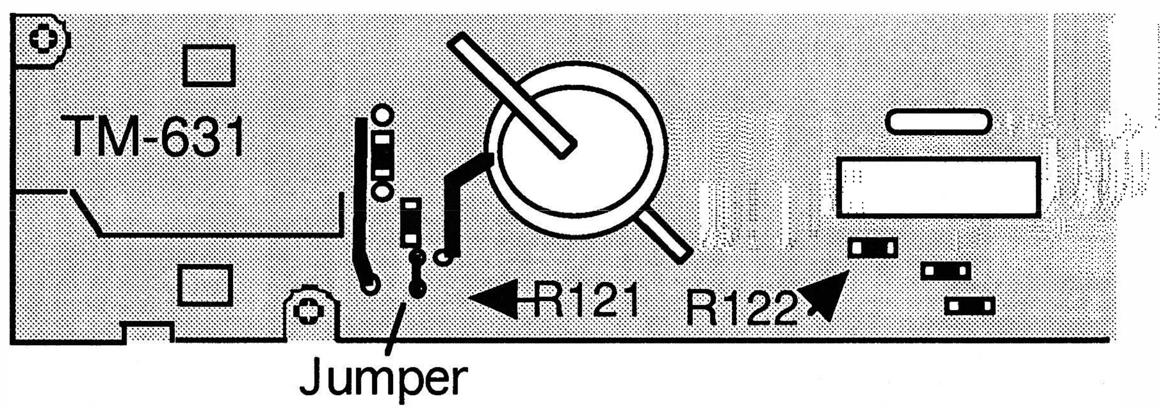


These modifications have not been tested. The Author, Publisher and all other parties takes NO responsibility or liability for any damage or violation resulting from these modifications. Performing any modification may be a Violation of FCC Rules and will void the warranty of the radio. Use of any modified radio may be a violation of FCC rules. If you have any doubts, DO NOT PERFORM THIS MODIFICATION.

KENWOOD TM-631

EXPANDED RF/ CROSS BAND REPEATER/ TIME OUT TIMER

1 Remove power and antenna and the top and bottom covers.
2. CUT RESISTOR R25. R25 is located on the Control unit on the bottom side of the Radio. The resistor can be seen by looking through the cutout of the chassis just behind the front panel.
3. Remove silver color screws from the front chassis. The screws are located 2 on each side, 1 on the top and 1 on the bottom.
4. Pull the front panel away from the radio. Do not unplug any cables.
5. Install a jumper wire as shown in diagram 1.
6. Remove R121. (This is the Cross band repeater mod.)
7. Remove R122. (This will override the automatic 3 minute time out timer)
8. Reassemble the radio.
9. Reset the microprocessor twice. Press and hold the [MR] key and turn radio on.



CROSS BAND OPERATING PROCEDURES: The TM-631 will receive a signal on one band and will automatically retransmit it on the other band. Each band can contain shift information. Only one band may contain PL encode/decode information. Do not turn Tone and CTCSS on in one band.

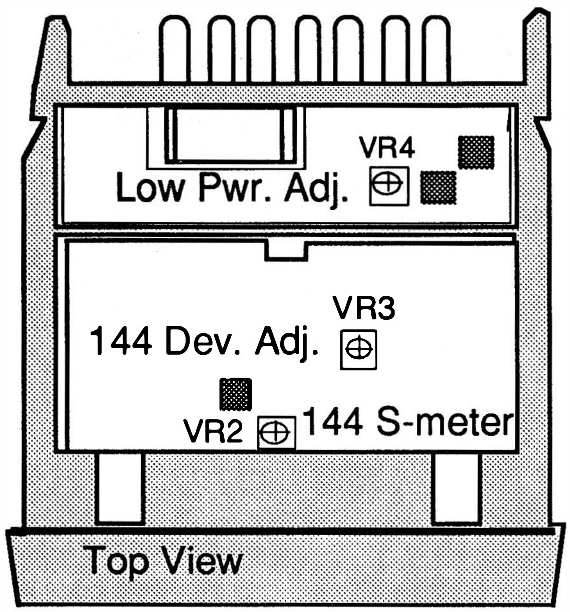
Turn on / off the Repeater mode : Press [F] and then press [A.B.C.] Key. Three dots should appear in the display when the mode is on.

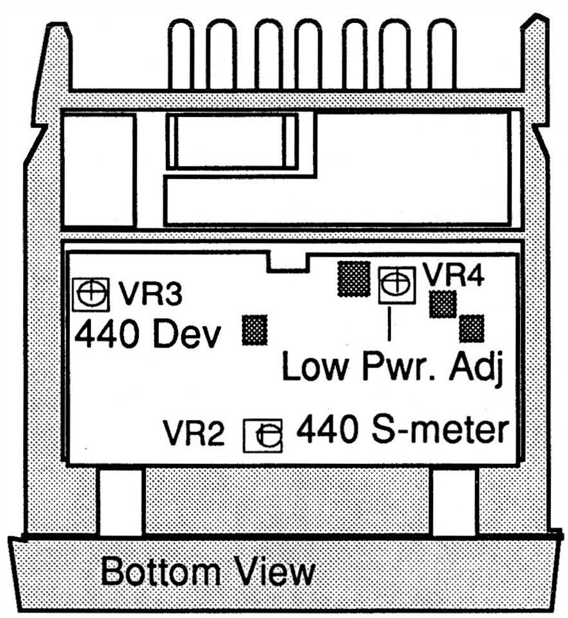
MORE ---

Caution

KENWOOD TM-631

ALIGNMENT POINTS





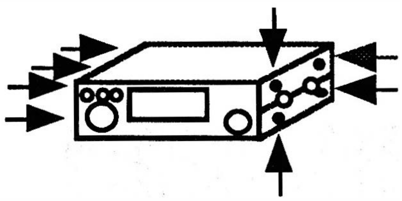


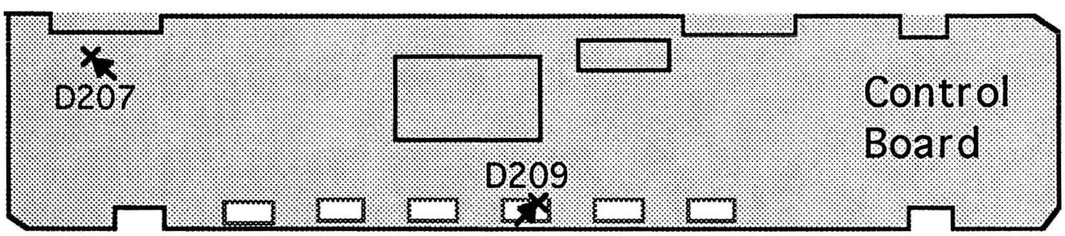
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KENWOOD TM-701A

EXPANDED RF / CROSS BAND REPEATER

1 Disconnect the power and antenna.
2. Remove the top and bottom cover.
3. Remove knobs from front panel and the nuts from the mic and channel switch.
4. Remove 4 screws holding the front panel and the 3 screws on the control board.
5. Locate the green jumper wire sticking out the front panel, behind the VFO button.
6. Cut the green jumper and tape the edges to prevent them from shorting.
7. Optional: Install diodes D207 & D209 on control board X57-3350-00.
8. Solder a jumper to the foil side of the TX-RX board as shown in drawing.
9. Reassemble the radio.
10. Reset the microprocessor (Press and hold [MR] while turning on the power).





CROSS BAND OPERATING PROCEDURES

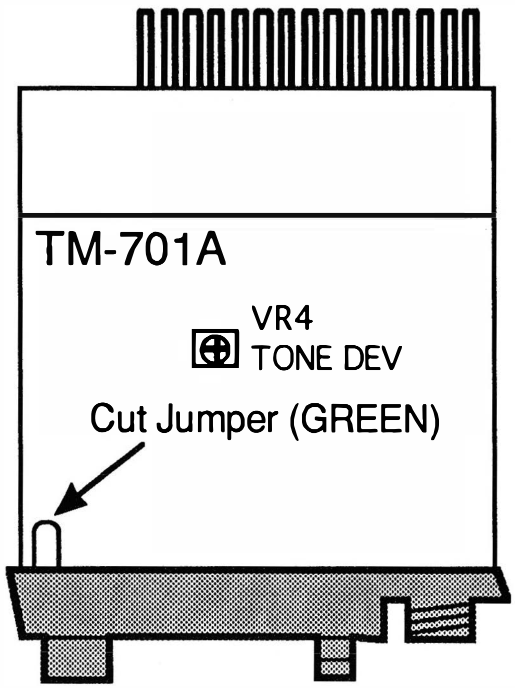
Turn on the Repeater mode : Press and hold [F] and then press [DUP]. Then Press [F} longer than 1 Second. The F indicator will blink. Press [LOW]. Three dots should appear in the display when the mode is on.

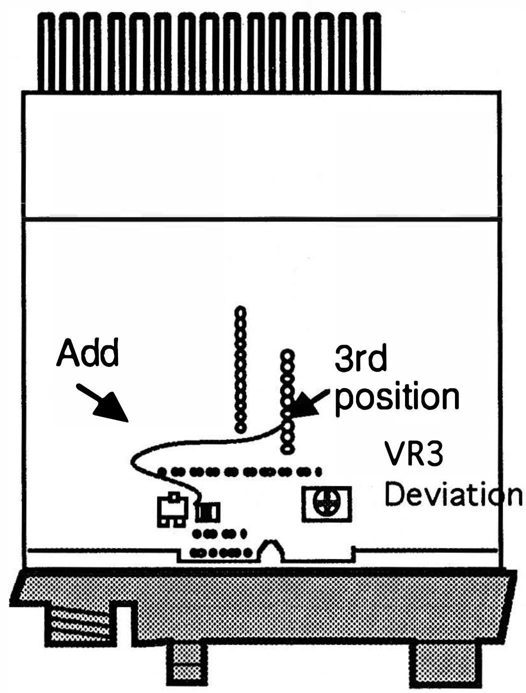
Turn off : Press [VFO].

MORE ---

KENWOOD TM-701A

ALIGNMENT POINTS





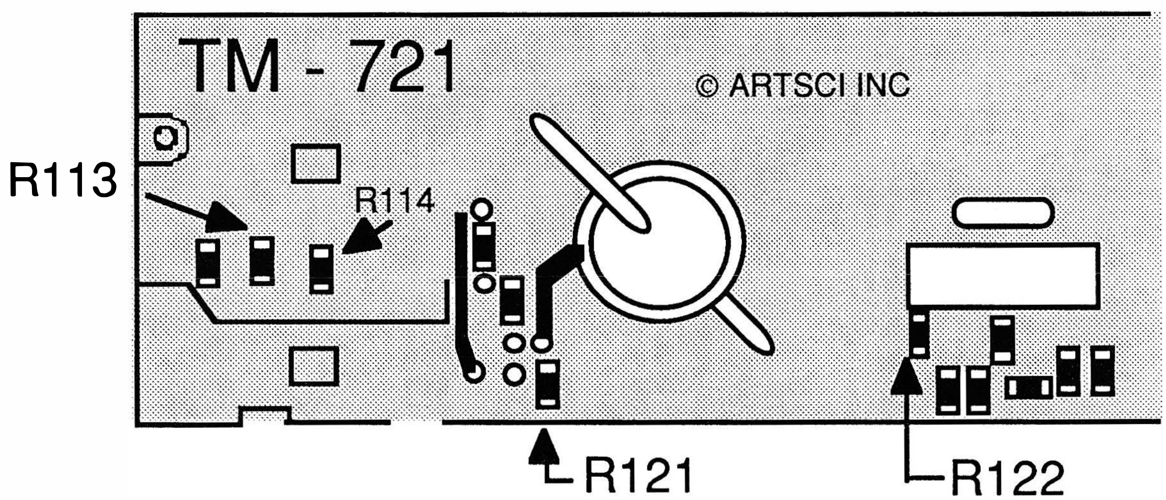
Caution

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KENWOOD TM-721

EXPANDED RF/ CROSS BAND REPEATER

1 Remove power, antenna and the top and bottom covers.
2. Remove the six silver screws holding the front panel to the chassis.
3. Locate R113 and R114
4. Solder a jumper between the open pads between R113 & R114
5. Remove R121. (This is the cross band repeater mod.)
6. Remove R122. (This will override the automatic 3 minute time out timer)
7. Cut R57 from the back of the board. Do not cut R58
8. Reassemble the radio
9. Reset the microprocessor twice. Press and hold the MR key and turn the power switch. Do this twice.



CROSS BAND OPERATING PROCEDURES

The TM-721 will receive a signal on one band and will automatically retransmit it on the other band. Each band can contain shift information. Only one band may contain PL encode/decode information. Do not turn tone and CTCSS on in one band.

Turn on / off the Repeater mode : Press F and then press A.B.C. Key. Three dots should appear in the display when the mode is on.

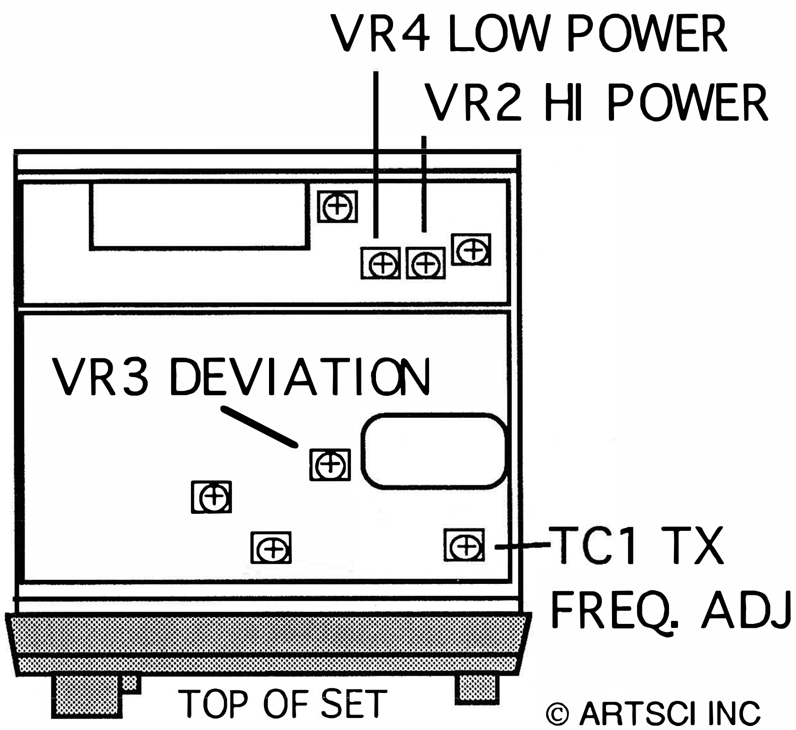
MORE ---

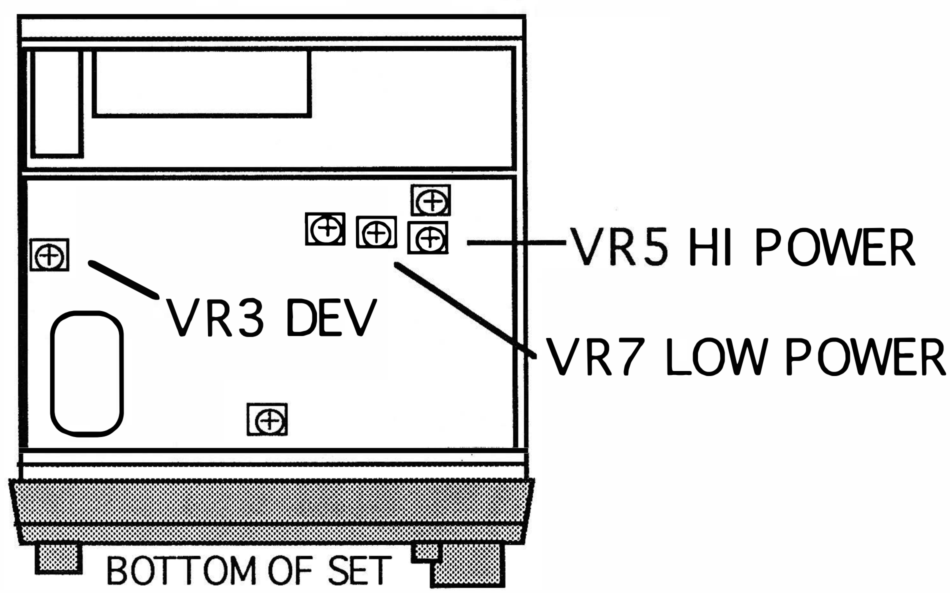


Caution

KENWOOD TM-721

ALIGNMENT CONTROLS





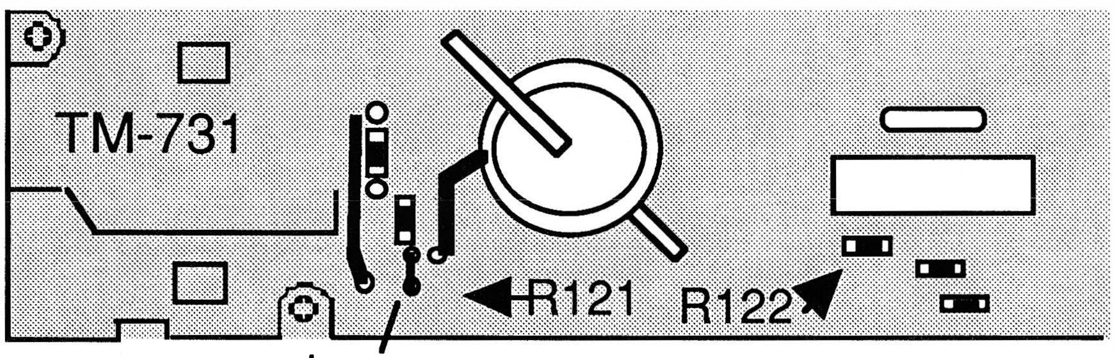
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KENWOOD TM-731

EXPANDED RF/ CROSS BAND REPEATER/ TIME OUT TIMER

1 Remove power and antenna and the top and bottom covers.
2. CUT RESISTOR R25. R25 is located on the Control unit on the bottom side of the Radio. The resistor can be seen by looking through the cutout of the chassis just behind the front panel.
3. Remove silver color screws from the front chassis. The screws are located 2 on each side, 1 on the top and 1 on the bottom.
4. Pull the front panel away from the radio. Do not unplug any cables.
5. Install a jumper wire as shown in diagram 1.
6. Remove R121. (This is the Cross band repeater mod.)
7. Remove R122. (This will override the automatic 3 minute time out timer)
8. Reassemble the radio.
9. Reset the microprocessor twice. Press and hold the [MR] key and turn radio on.



CROSS BAND OPERATING PROCEDURES: The TM-731 will receive a signal on one band and will automatically retransmit it on the other band. Each band can contain shift information. Only one band may contain PL encode/decode information. Do not turn Tone and CTCSS on in one band.

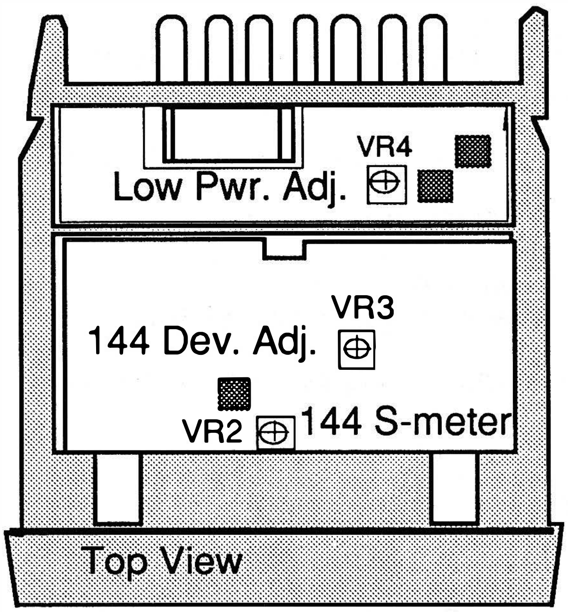
Turn on / off the Repeater mode : Press [F] and then press [A.B.C.] Key. Three dots should appear in the display when the mode is on.

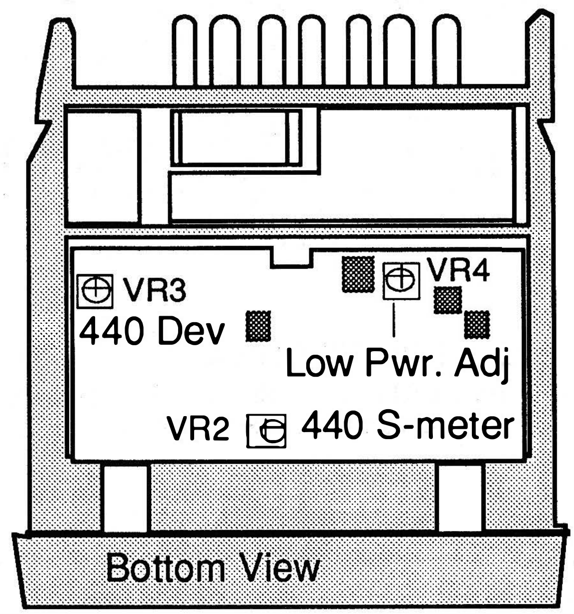
MORE ---



KENWOOD TM-731

ALIGNMENT POINTS







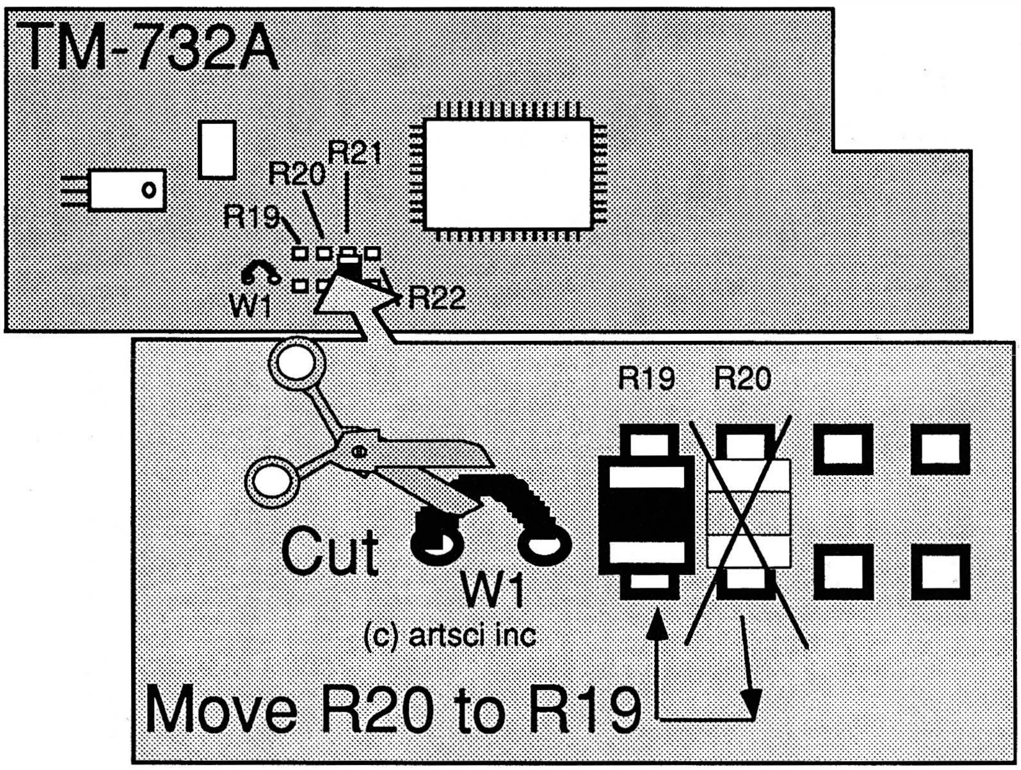
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KENWOOD TM-732A

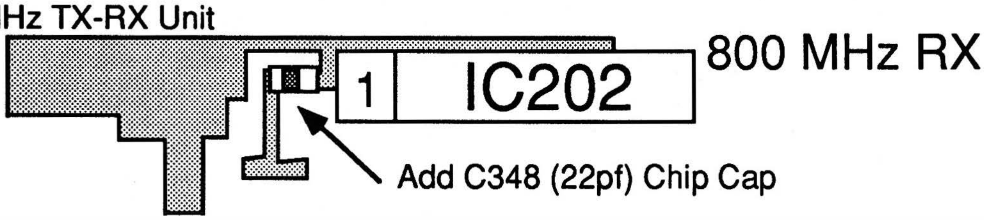
EXPANDED RF

1 Remove power, antenna and the top and bottom covers.
2. Remove front display and expose circuit board.
3. Clip Jumper W1. (Expanded RX and 800 MHz)
4. Remove Resistor R20.
5. Place the removed resistor and place it in position R19. (Expanded TX)
6. Add a 22pf chip cap in position C348 on the 440 TX-RX board. (800 MHz RX mod)
6. Reassemble the radio.
7. Reset the microprocessor. (press [MR] and turn power on)

800 MHz	Enable:	Press and hold [VFO] & [MHz] simultaneously.
	Disable:	Press and hold [MR] & [MHz) simultaneously.



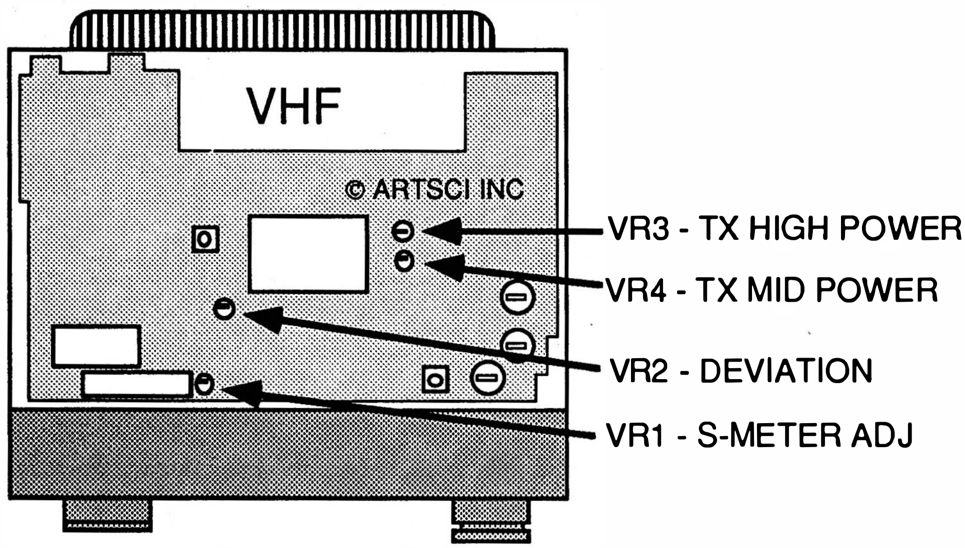
430 MHz TX-RX Unit



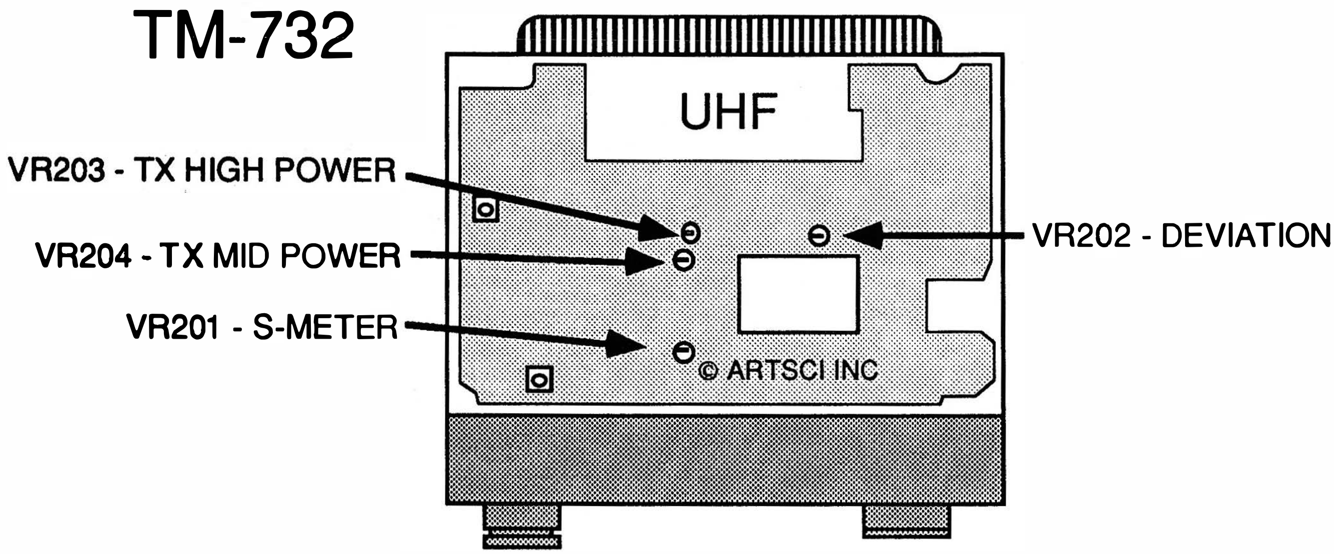
MORE --

KENWOOD TM-732A

ALIGNMENT CONTROLS



TM-732



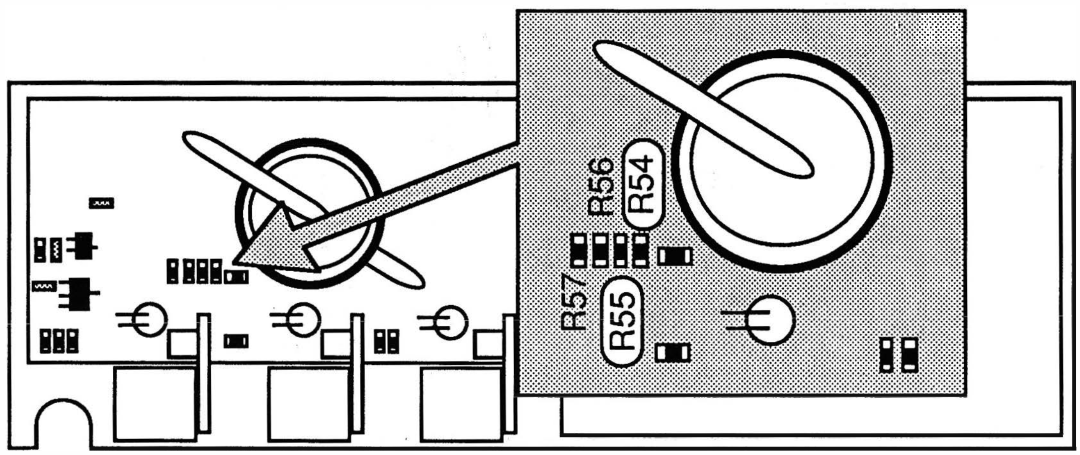
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KENWOOD TM-741

EXPANDED RF

1 Remove power and antenna
2. Detach the front control head assembly.
3. Locate and cut the GREEN wire on the control board. The control board is on the body of the radio. The GREEN wire is located towards the left edge of the board. Tape the edges of the green wire to prevent shorting.
4. Remove the back cover from the control head.
5. Locate and remove chip resistors R54 and R55. Caution should be taken while removing these resistors.
6. Reassemble the control head.
7. Reassemble the transceiver.



New Frequency range:

18-54 MHz
50-90 MHz
118-174 MHz
215-260 MHz
410-470 MHz
1100-1400 MHz

MORE ---

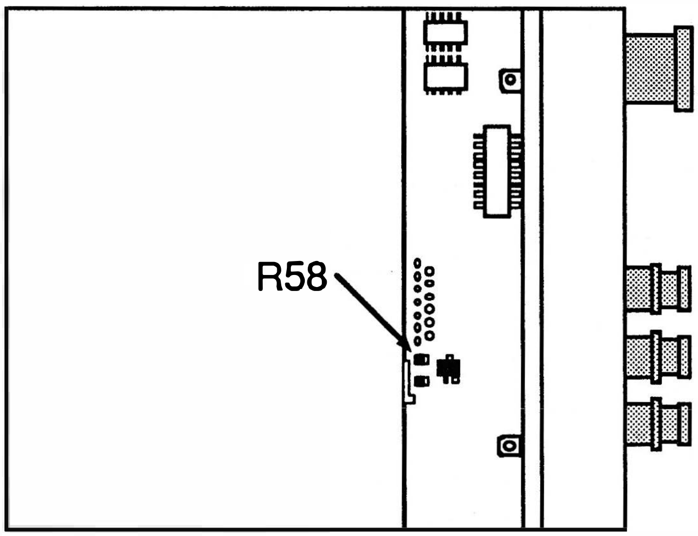


Caution

KENWOOD TM-741 & TM-941

CROSS BAND REPEATER

1 Remove power and antenna and the top and bottom covers.
2. Detach the front panel assembly.
3. Locate and cut the GREEN wire on the control board. The control board is on the body of the radio. The GREEN wire is located towards the left edge of the board.
4. Locate and cut resistor R58. R58 is blue colored and located on the control board (Cross band repeater mod)
5. Reassemble the transceiver.



CROSS BAND OPERATING PROCEDURES: The TM-X41 will receive a signal on one band and will automatically retransmit it on the other band. Each band can contain shift information. Only one band may contain PL encode/decode information. Only one band may contain Tone and CTCSS.

1 Select one of the band using the BAND SELECT key.
   (The PTT indicator will light.)
2. Select the other band by pressing the CONTROL SELECT key.
   (Skip this step for one way repeat only)
   (The green light on the key will light.)

Turn on / off the Repeater mode :

Press the [F] key and then press the [MUTE] key.

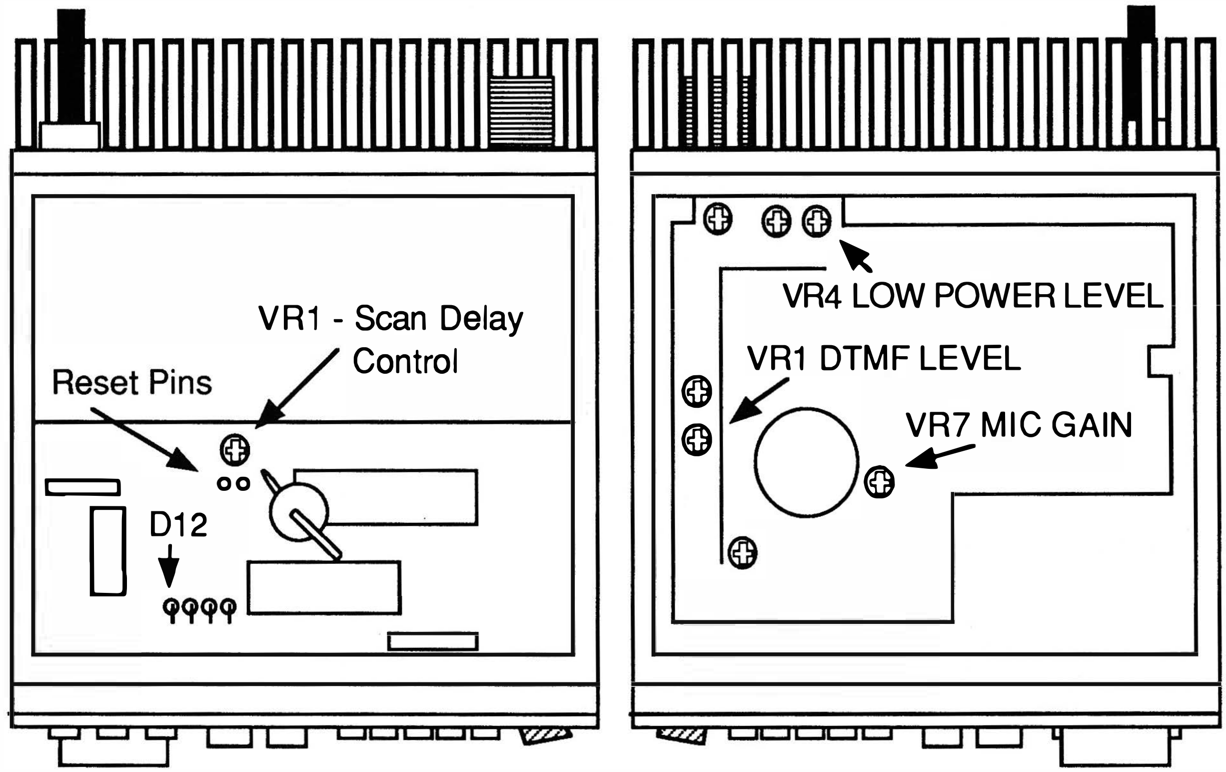


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KENWOOD TM-2530, TM-2550, TM-2570

EXPANDED RF

1 Disconnect the power and antenna.
2. Remove the bottom case .
3. Locate the Control Unit on the bottom of the radio. This is the same board the TU-7 & MU-1 are mounted on.
4. CUT diodes D8 & D11 & D12. They are located to the left of IC3.
5. Reassemble the radio.
6. RESET the CPU. Press and hold the [PS] Key while turning on the radio.



Frequency increases to 150.995 MHz

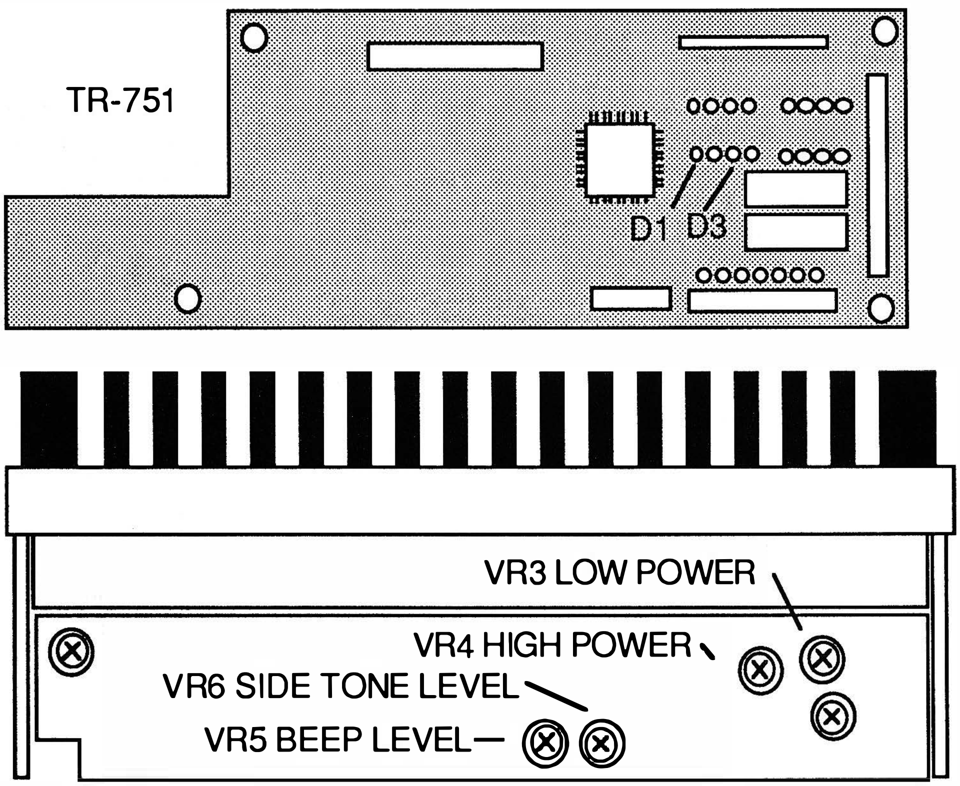
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KENWOOD TR-751

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the case .
3. Locate the Control Unit on the radio.
4. CUT diodes D1 & D3. They are located to the left of IC3.
5. Reassemble the radio.
6. RESET the CPU. (Hold [M] key and turn on power)



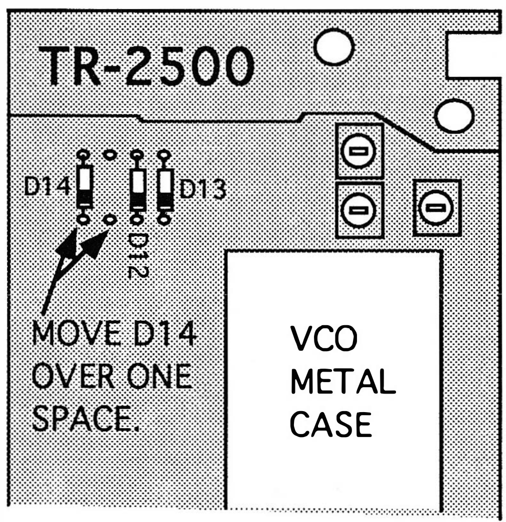
DEVIATION - VR7 ON RX UNIT (OTHER SIDE)


Caution

KENWOOD TR-2500

EXPANDED RF M/C

1 Disconnect the battery and antenna.
2. Remove the 3 screws holding on the back cover.
3. Remove the 2 screws on the bottom of the radio.
4. Unsolder the tabs of the lithium battery.
5. Unsolder Diode D14.
6. Install the diode in the location next to D12.
7. Reinstall the lithium battery.
8. Reassemble the radio.



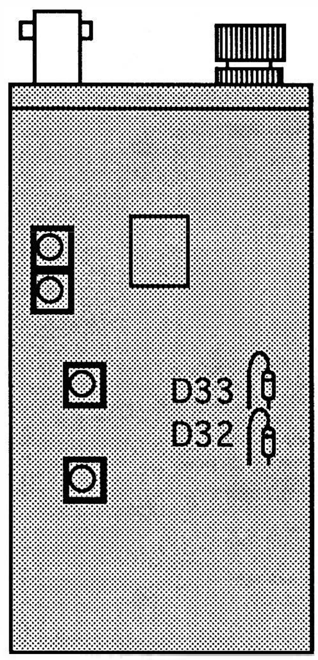
Range : 141.000 MHz to 151.000 MHz

Caution

KENWOOD TR-2600

EXPANDED RF M/C

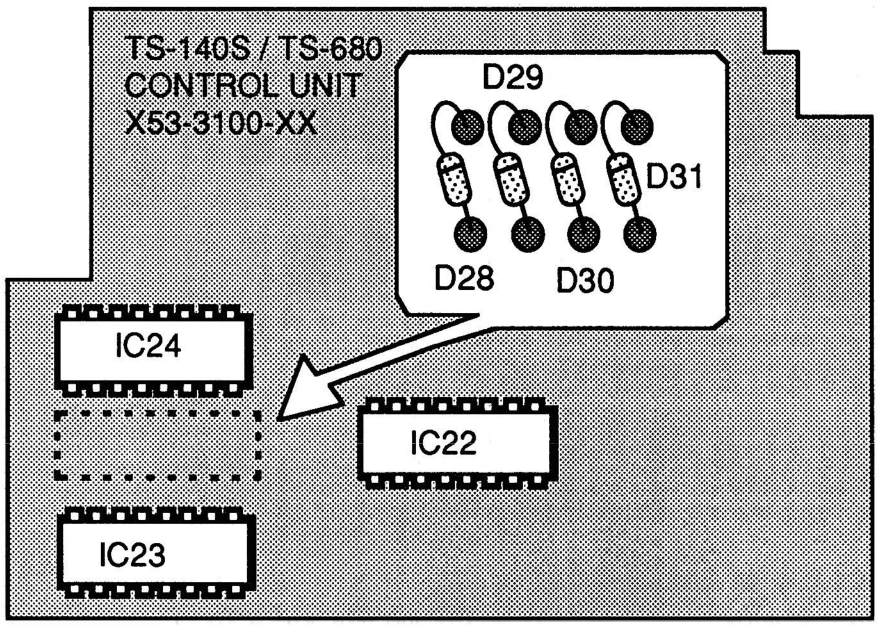
1 Disconnect the power and antenna.
2. Remove the screws and open the radio.
3. Remove diodes D32 & D33. They are located on the RX unit (x%%-1380-XX)
4. Press the RESET Switch
5. Reassemble the radio.



KENWOOD TS-140S

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom covers from the radio.
3. Locate the Control board on the bottom of the TS-140S
4. Remove diode D31 on the Control board.
5. Reassemble the radio.
6. RESET the CPU.



Auxiliary Function:

1. Put radio in VFO mode and turn power off.
2. Press and hold [VFO/M] & [LSB/USB] and turn power on.

The display will say " -HELLO-"
The CW announcement will please you.



Caution

KENWOOD TS-430S

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom covers from the radio.
3. Locate connector # 10 on the RF circuit board
4. Cut the two wires that are NOT GREEN. Leave the Green Wire.
5. Wrap Tape around the ends of the cut wires
6. Reassemble the radio.
7. RESET the CPU.

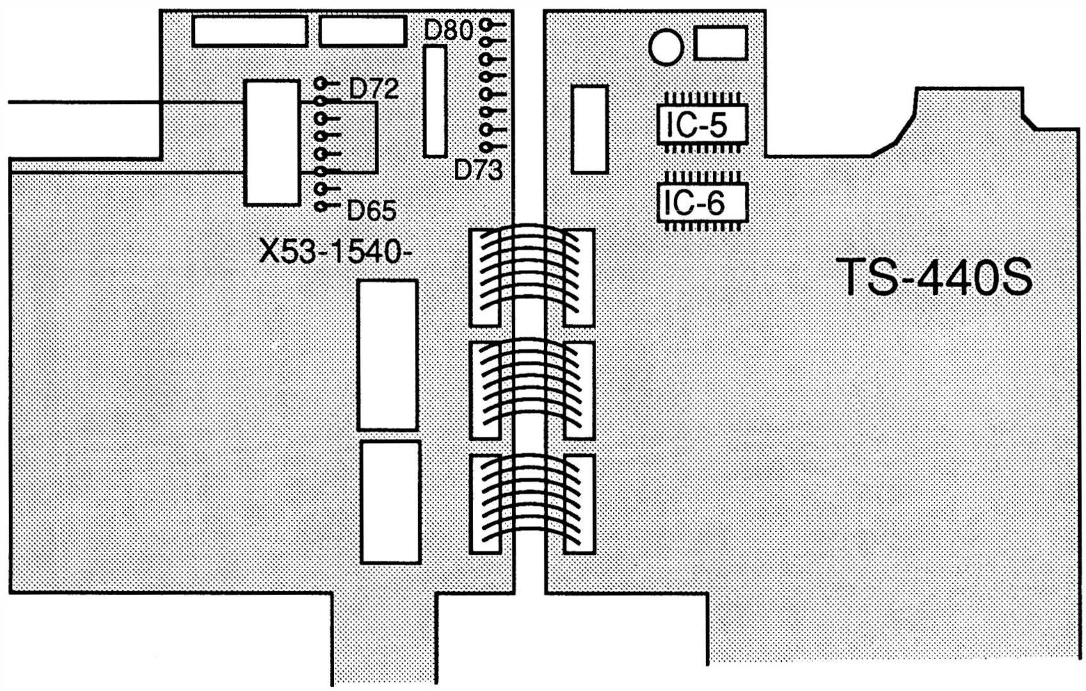


Caution

KENWOOD TS-440S

EXPANDED RF M/C

1 Disconnect the Power and antenna.
2. Remove the top and bottom covers from the radio.
3. Remove the Countersunk screws that secure the front panel to the chassis. There are two on each side
4. Gently pull the front panel forwards.
5. Remove the 5 small round head screws that secure the shield plate to the front panel. There are 2 on top and 3 on the bottom.
6. Remove Diode D80. D80 is located in the corner near Connector 54.
7. Cut Diode 66 for 10 Hz resolution. See page 24 of the instruction manual.
8. Reassemble the radio.
9. RESET the CPU.



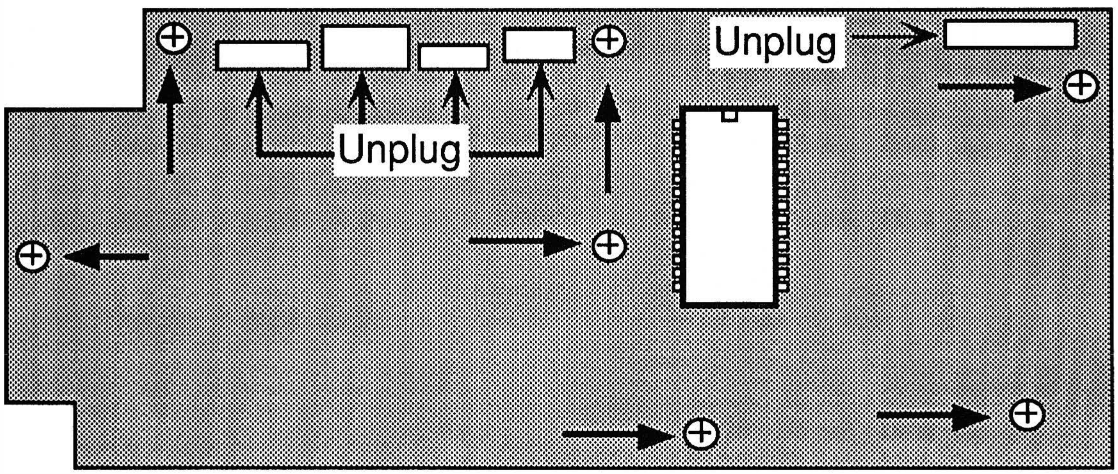
RESET CPU: Press and hold [A=B] and turn power on.

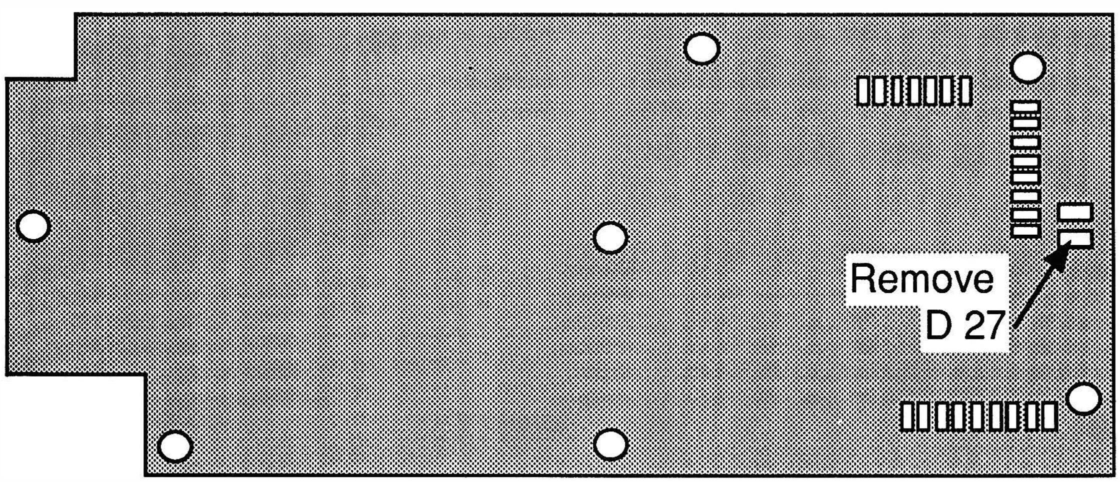


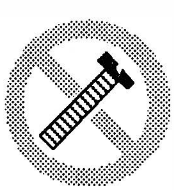
KENWOOD TS-450S

EXPANDED RF M/C

1 Disconnect the Power and antenna.
2. Remove the top and bottom covers from the radio. (14 Screws)
3. Remove the top screws (countersunk) from aech side of the front panel.
4. Loosen the bottom screws (countersunk) from aech side of the front panel.
5. Carefully pull the top front of the front panel forward to expose the Digital board.
6. Remove the seven screws from the digital board.
7. Disconnect the 5 cables from the digital board.
8. Rotate the board towards the front panel to gain access to the back side of the board.
9. Locate and remove diode D27. Do not pry up the diode. The traces will rip apart.
10. Reassemble the radio.



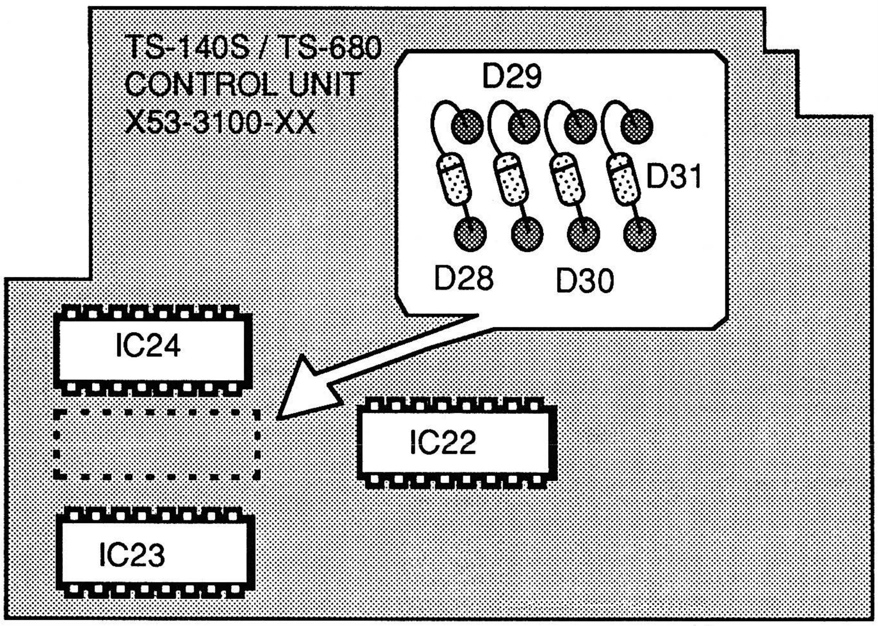




KENWOOD TS-680

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom covers from the radio.
3. Locate the Control board on the bottom of the TS-680S
4. Remove diode D31 on the Control board.
5. Reassemble the radio.
6. RESET the CPU.



Auxiliary Function:

1. Put radio in VFO mode and turn power off.
2. Press and hold [VFO/M] & [LSB/USB] and turn power on.

The display will say " -HELLO-"
The CW announcement will please you.

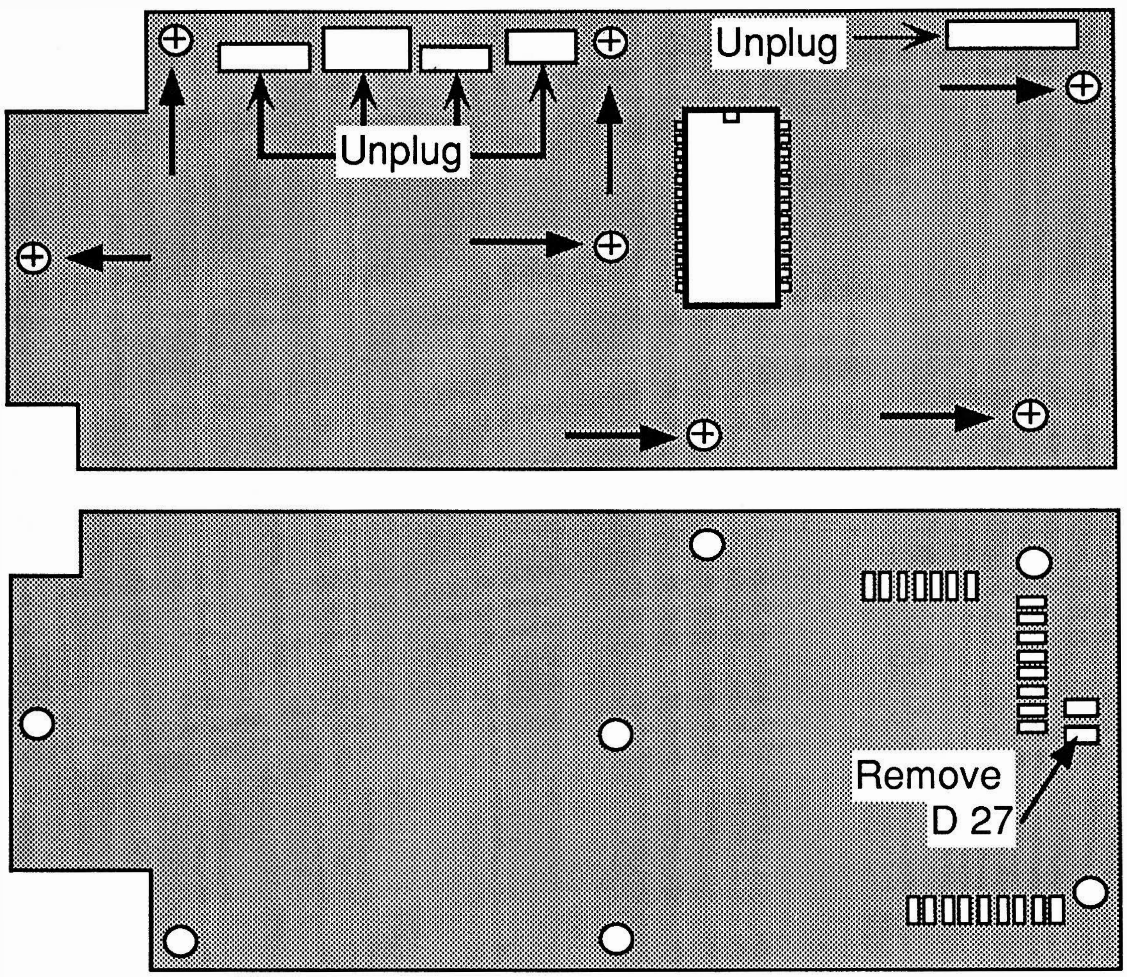


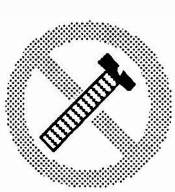
Caution

KENWOOD TS-690S

EXPANDED RF M/C

1 Disconnect the Power and antenna.
2. Remove the top and bottom covers from the radio. (14 Screws)
3. Remove the top screws (countersunk) from aech side of the front panel.
4. Loosen the bottom screws (countersunk) from aech side of the front panel.
5. Carefully pull the top front of the front panel forward to expose the Digital board.
6. Remove the seven screws from the digital board.
7. Disconnect the 5 cables from the digital board.
8. Rotate the board towards the front panel to gain access to the back side of the board.
9. Locate and remove diode D27. Do not pry up the diode. The traces will rip apart.
10. Reassemble the radio.



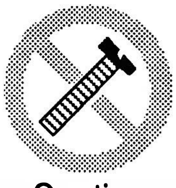


Caution

KENWOOD TS-711

EXPANDED RF

1 Disconnect the power and antenna.
2. Remove the covers.
4. REMOVE D30
5. Reassemble the radio.
6. RESET the CPU.

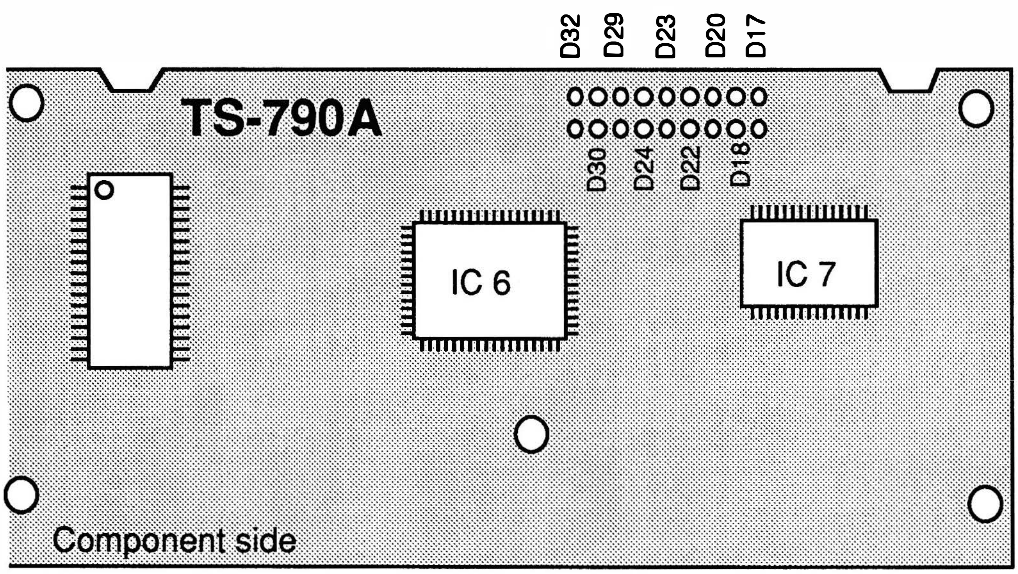


Caution

KENWOOD TS-790A

EXPANDED RF & X-BAND REPEATER

1 Disconnect the power and antenna.
2. Remove the top cover.
3. Locate circuit board positioned vertically behind the front panel.
4. Locate and remove diodes D29 & D30.
5. Locate and remove diode D32. (X-Band mod)
5. Reassemble radio
6. Reset the microprocessor. (Press and hold [A=B] and turn power on)



Note: Factory diode set-up: IN-D22,29,30,32
IN but clipped by factory-D23,24
Empty position=D17,18,20

RANGE: 130-170 MHz & 422.2-463 MHz

X-Band ON/OFF - [F] and then [M.IN] (A Star will appear on the display when on)
Reports state X-BAND works in all modes.

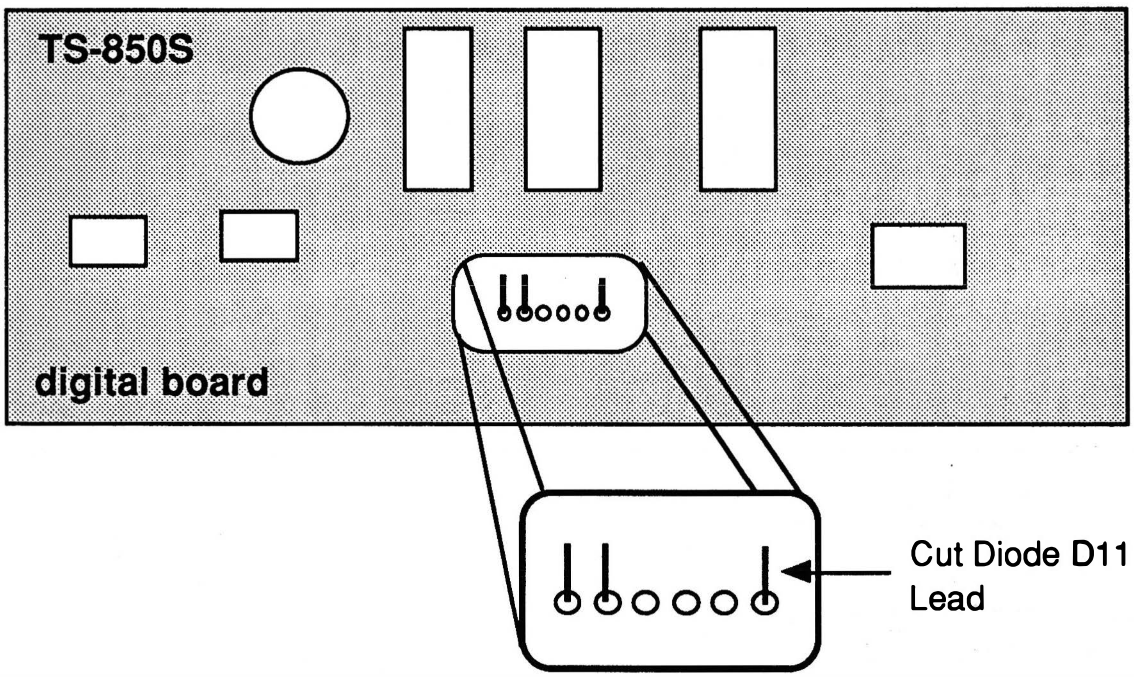


Caution

KENWOOD TS-850S

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the 16 screws top and bottom covers from the radio. Be careful not to **break** the speaker wires.
3. Remove the top and bottom screws from each side of the front panel assembly.
4. Pull the front panel forward to expose the Digital board.
5. Locate and cut the lead from diode D11.
6. Reassemble the radio.
7. Reset the microprocessor bu holding the [A=B] Key while turning the power on.



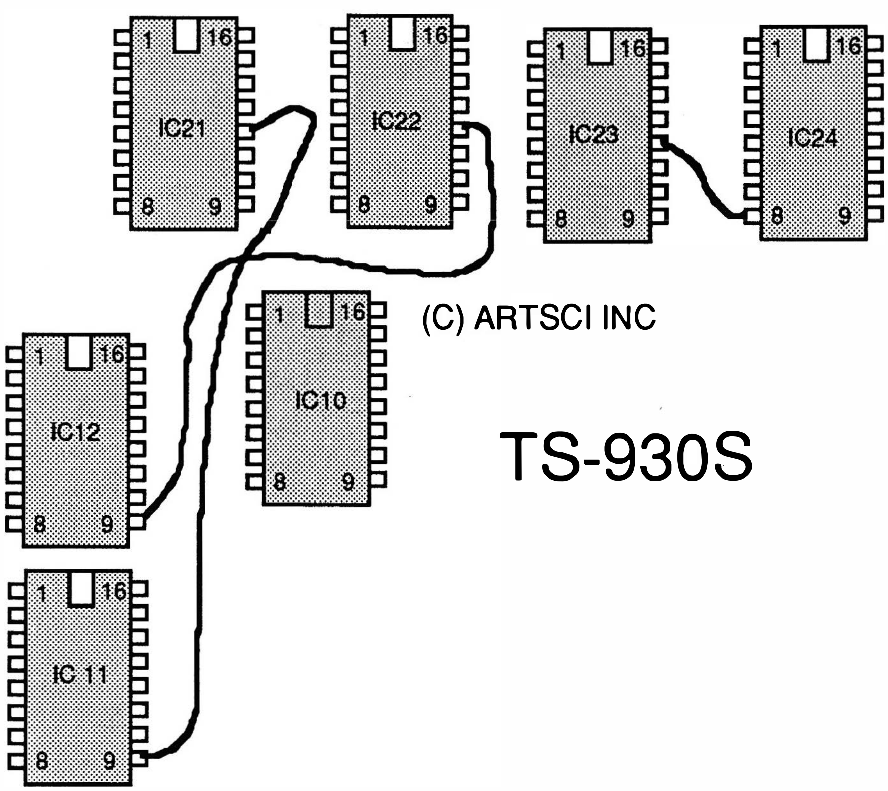


Caution

KENWOOD TS-930S

EXPANDED RF M/C

1 Disconnect the power and antenna.
2. Remove the top and bottom covers from the radio.
3. Remove the four screws from the speaker mounting and the top panel Assembly.
4. Swing the assembly away and unplug the Red/Black battery leads from the Digital unit X54-1680-00.
5. Solder wires between the following locations:
   IC21 Pin 12 to IC11 Pin 9
   IC22 Pin 12 to IC12 Pin 9
   IC23 Pin 12 to IC24 Pin 8
   Tack-solder on the component side of the board is OK
5. Reassemble the radio.



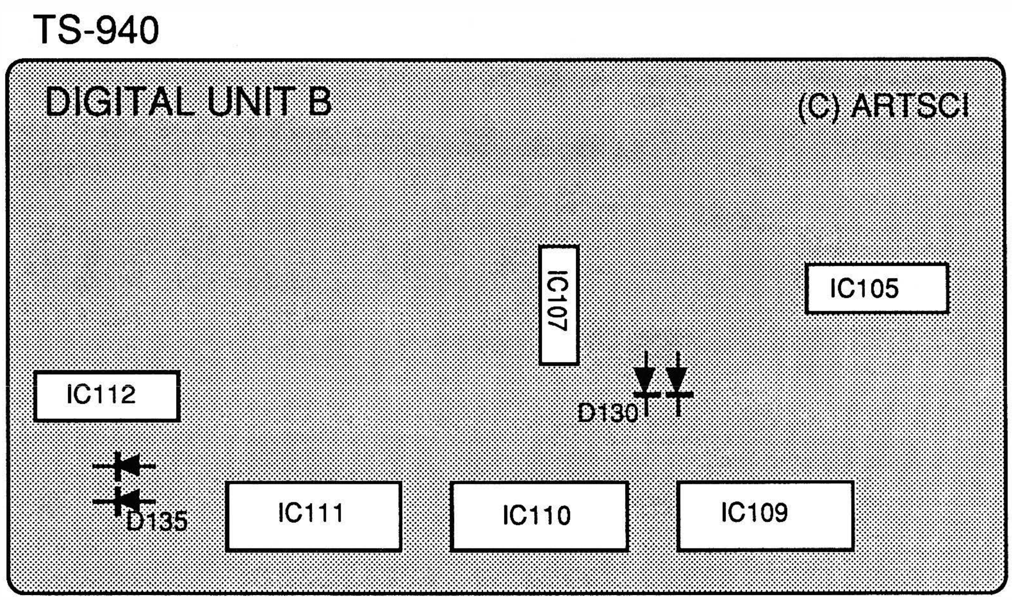
Caution

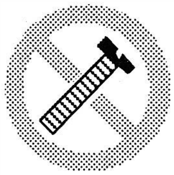
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KENWOOD TS-940

EXPANDED RF

1 Disconnect the power and antenna.
2. Remove case screws and case.
3. Locate Digital Unit B. This is the board that is in the enclosure where the VS-1 is mounted. Digital Unit B is the board closest to the Front Panel.
4. Cut Diodes D130 & D135. Located near IC-109.
5. Reassemble the radio
6. Turn the radio on, Press and Hold the [A=B] Switch and turn off and back on the radio.



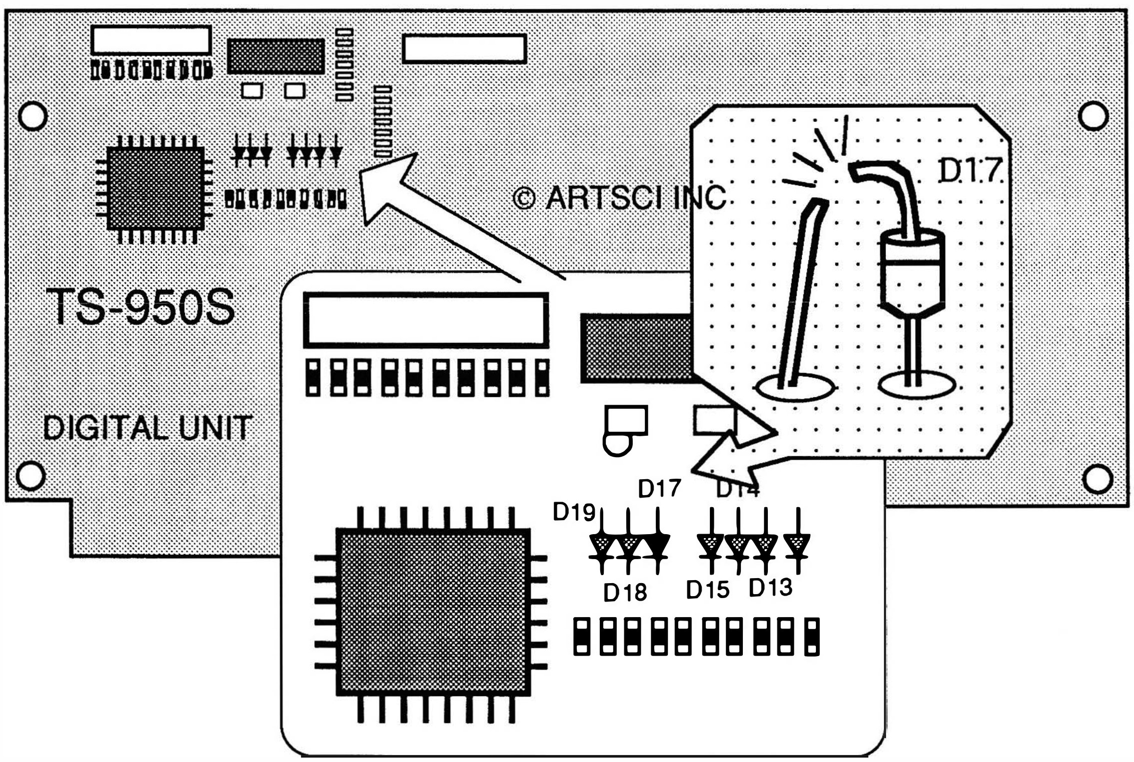


KENWOOD TS-950SD

EXTENDED RF

1. Remove power and antenna.
2. Remove the top and bottom covers
3. Locate the Digital Unit.
4. Cut diode D-17
5. Reassemble the Radio
6. Reset the Microprocessor.

RESET: Press and hold [A=B] and turn power on.





KENWOOD TS-2400

EXTENDED RF

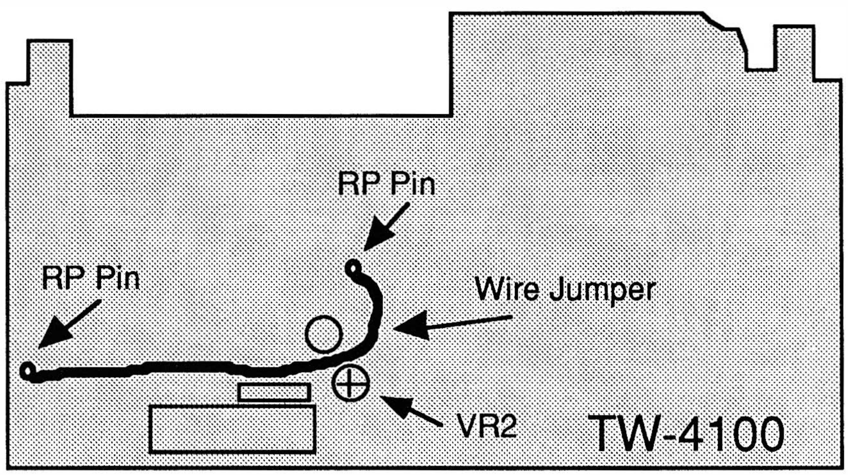
1. Remove Power and Antenna.
2. Open the radio.
3. Locate the RX Circuit board.
4. Locate and cut Diodes D32 and D33. (Located near the DTMF IC)
5. Reassemble the radio.
6. Reset the Microprocessor.

Caution

KENWOOD TW-4100

REPEATER MOD

1. Remove power and antenna.
2. Remove 4 screws securing the top cover.
3. Remove 10 screws securing the bottom cover.
4. Solder a wire jumper connecting the two RP Pins. (see drawing)
5. Reassemble the radio.



CROSS BAND REPEATER PROCEDURES

The VFO and a Memory channel (except 8 & 9) must be used. Select the proper frequencies, offsets & tone. (VFO simplex operation must use DUP with a 0 offset.)

TURN ON - Enter frequencies in a memory and VFO and press [Shift].
Turn power off. Press and hold [REV] and turn radio on.

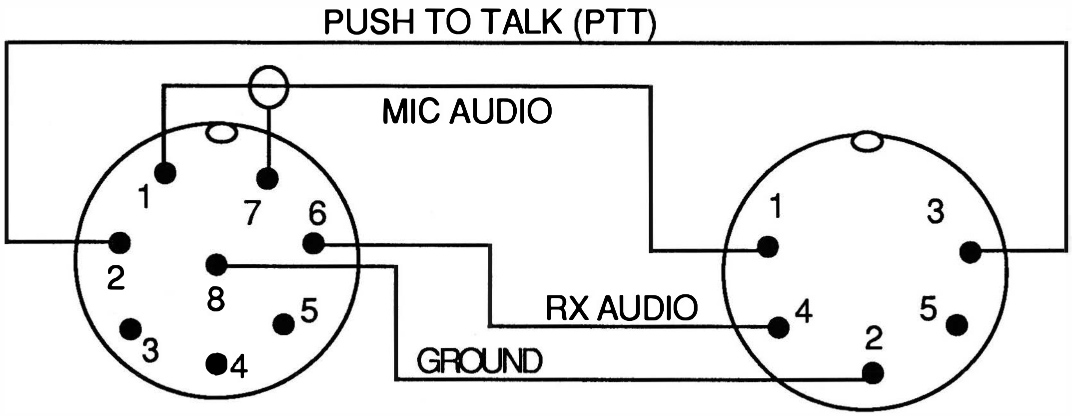
TURN OFF - Turn Power off.



Caution

KENWOOD TM SERIES

TNC-2 HOOKUP



Kenwood TM SERIES

TNC-2 OR CLONE

Caution

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Performance Report

Radio ______________________________ Date ____________

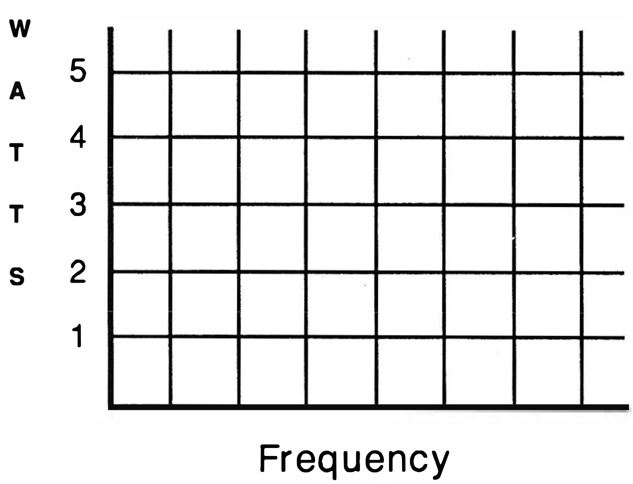
Owner : Name ____

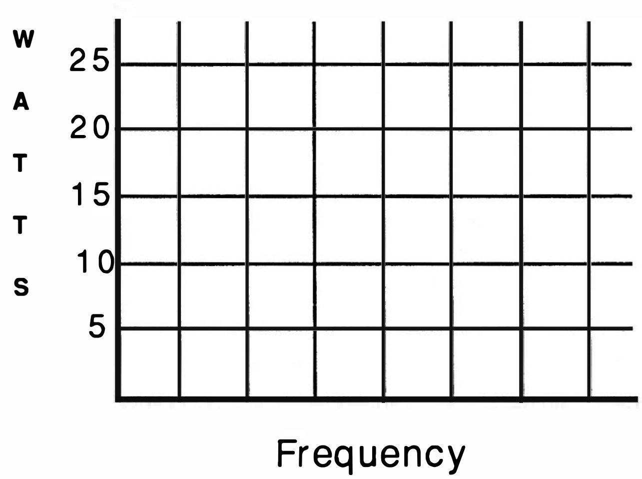
Address ____

City ____________________ St. ______ Zip ______

Phone (   ) ______ - ______

Description	Before	After
Power out (Low)	________ Watts	________ Watts
Power out (High)	________ Watts	________ Watts
Frequency Error (Simplex)	________ Hz	________ Hz
Frequency Error (Offset)	________ Hz	________ Hz
Receive Sensitivity (Mid-band)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
PL Deviation	________ Hz	________ Hz
DTMF Deviation	________ KHz	________ KHz
Audio Deviation	________ KHz	________ KHz
Lowest usable Freq @ .5 Pwr	________ MHz	________ MHz
Highest usable Freq @ .5 Pwr	________ MHz	________ MHz





Radio / Tech Modifications

SCANNER Modifications

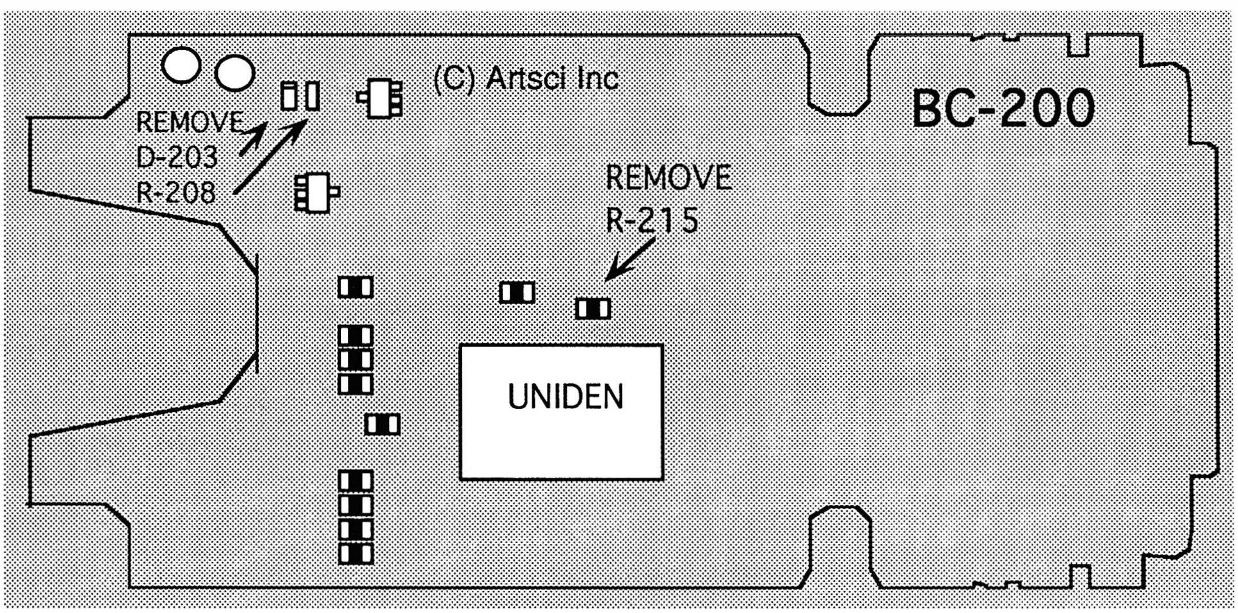
BEARCAT BC-200

EXPANDED RF (800MHz)
Extended Battery Life

1. Remove Battery and Antenna.
2. Remove 2 screws from case and 2 from the battery retaining plate and open case.
3. Locate and remove two small screws at the base of the circuit board.
4. Gently pull the front panel from the circuits.
5. Locate and remove the 10 K resistor R-215 located above the microprocessor (Uniden UC-1147). Note the resistor is above the "den" letters on the microprocessor.
6. Locate and remove the Diode D-203 and Resistor R-208 located by the Speaker. (Battery Mod)
6. Replace the front panel. Keep the holes in the bottom of the case and board lined up and make sure the dual in-line connector is reconnected properly.
7. Reassemble scanner.

If the radio fails to power up, recharge the battery or, the dual in-line connector was not inserted correctly. If the display will not work, make sure that the rows of fine pin are aligned properly with the socket.

Reset Command: Press & Hold [2], [9] & [MANUAL], Turn off and back on.





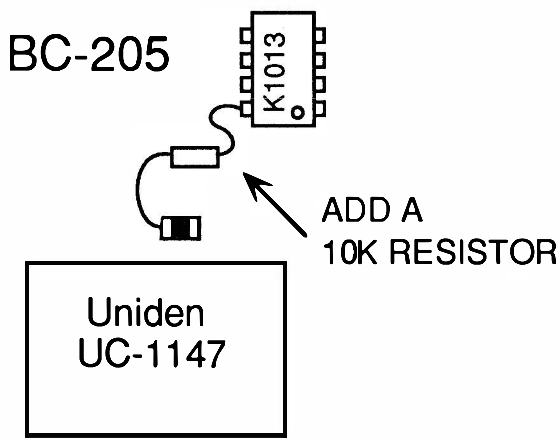
Caution

BEARCAT BC-205

EXPANDED RF (800MHz)
Extended Battery Life

1. Remove Battery and Antenna.
2. Remove 2 screws from case and 2 from the battery retaining plate and open case.
3. Locate and remove two small screws at the base of the circuit board.
4. Gently pull the front panel from the circuits.
5. Locate the 10 K resistor located above the microprocessor (Uniden UC-1147). Note the resistor is above the "den" letters on the microprocessor.
6. Add a 10K Resistor to From the Chip resistor to Pin 8 of the adjacent K1013 IC.
7. Reassemble the radio.

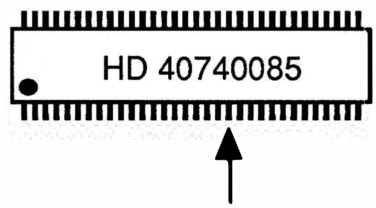
If the radio fails to power up, recharge the battery or, the dual in-line connector was not inserted correctly. f the display will not work, make sure that the rows of fine pin are aligned properly with the socket.



BEARCAT BC-760
EARLY MODELS (NO BNC CONNECTOR)

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove 4 screws from the bottom case remove the bottom cover.
3. Locate the microprocessor and clip pin 20.
4. Reassemble scanner.



Clip Pin 20

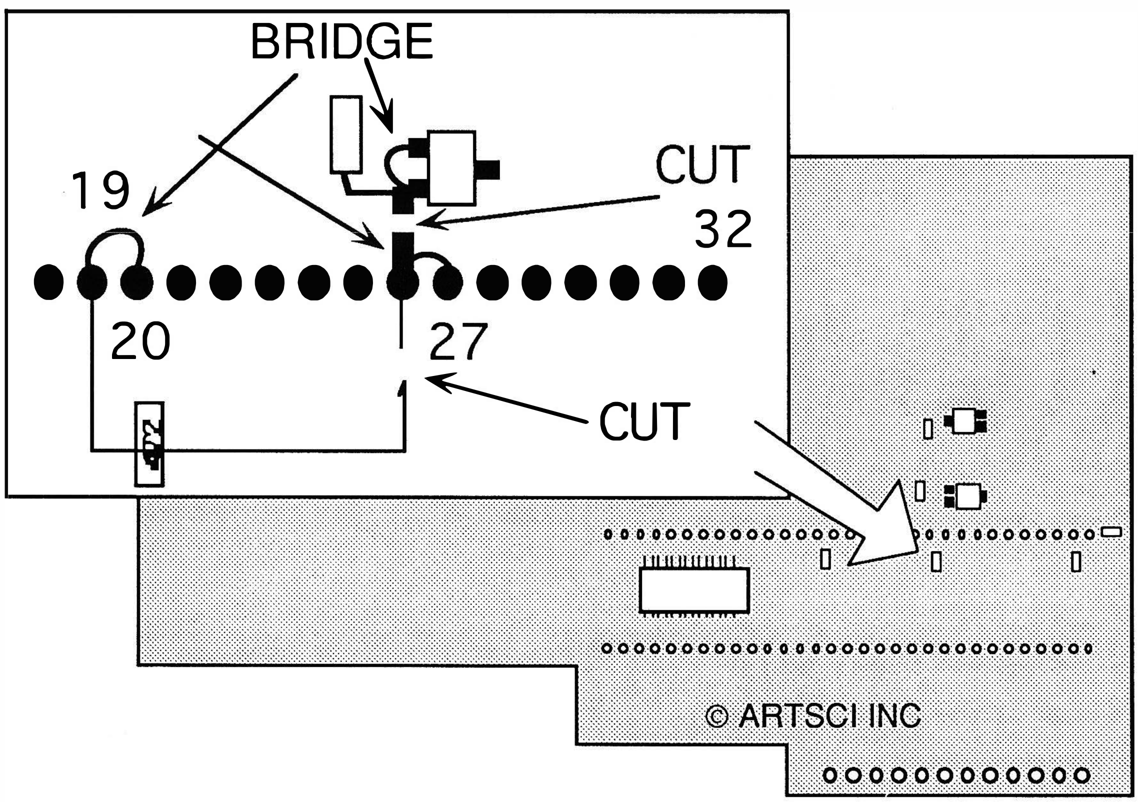
Caution

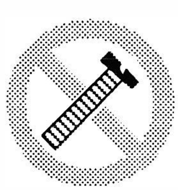
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BEARCAT BC-760
LATER MODELS (WITH BNC CONNECTOR)

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove 4 screws from the bottom case remove the bottom cover.
3. Locate the SANYO IC. (Identification printed upside down with the front of the radio facing you.
4. Locate the long row of solder pins above the Sanyo IC.
5. Locate Pin 26 of the Microprocessor.
6. Cut the two traces leading to pin 26.
7. Solder bridge Pins 19 & 20 together
8. Solder bridge Pins 26 & 27 together.
9. Solder bridge the two leads of the chip transistor above pin 27.
10. Unsolder or cut the 47K Chip Resistor marked "472"
11. Reassemble the radio.



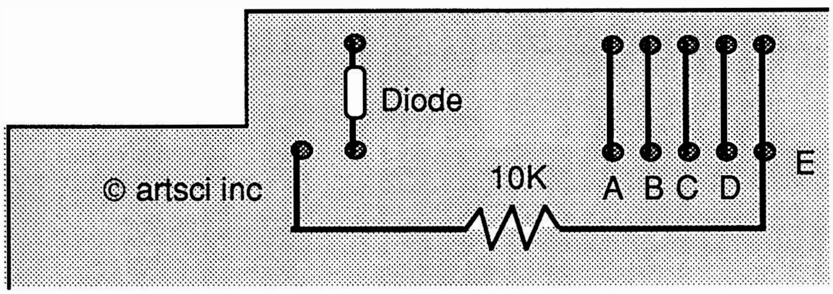

Caution

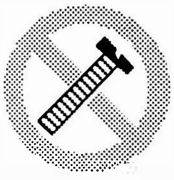
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BEARCAT BC-855XLT

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove screws and open radio.
3 Locate and remove jumper "E"
4. Solder a 10K resistor from the cut position to solder pad. (see drawing)
5. Assemble radio.



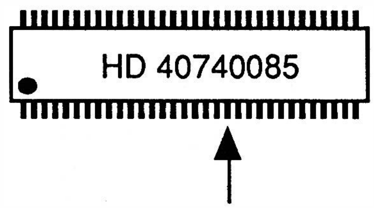

Caution

BEARCAT BC-950

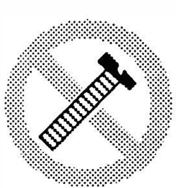
EARLY MODELS (NO BNC CONNECTOR)

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove 4 screws from the bottom case remove the bottom cover.
3. Locate the microprocessor and clip pin 20.
4. Reassemble scanner.



Clip Pin 20



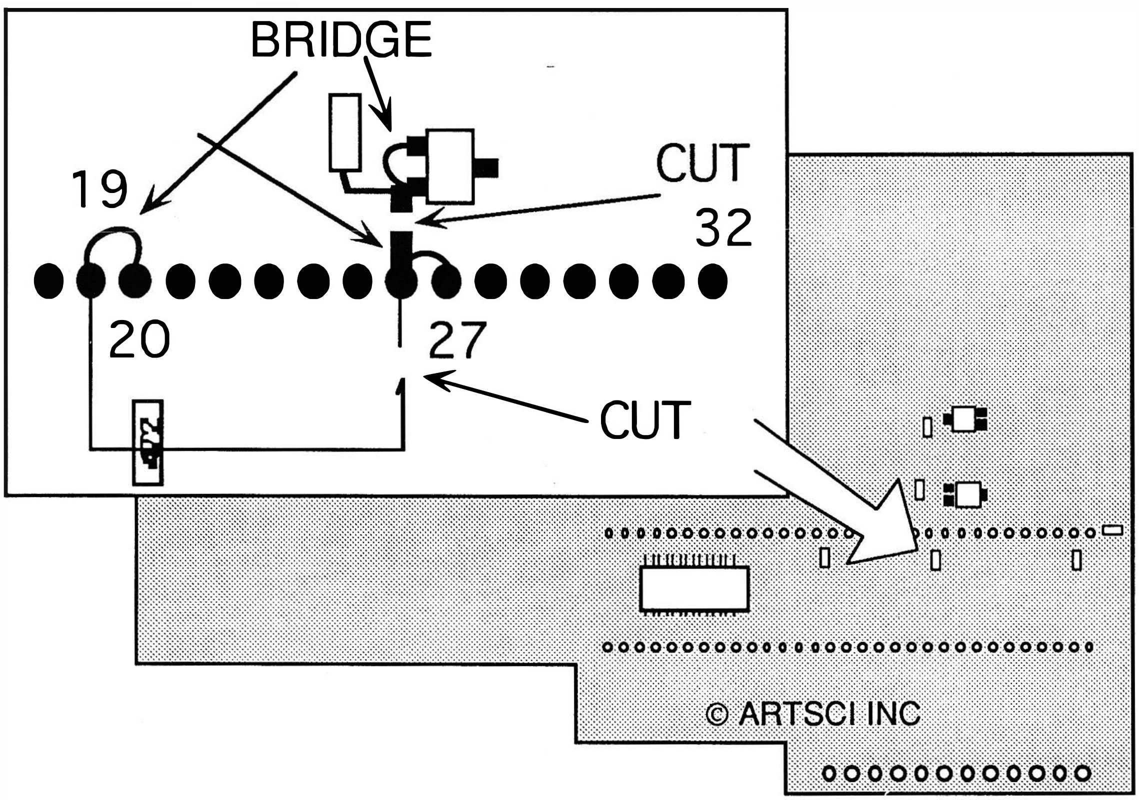
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BEARCAT BC-950XLT
LATER MODELS (WITH BNC CONNECTOR)

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove 4 screws from the bottom case remove the bottom cover.
3. Locate the SANYO IC. (Identification printed upside down with the front of the radio facing you.
4. Locate the long row of solder pins above the Sanyo IC.
5. Locate Pin 26 of the Microprocessor.
6. Cut the two traces leading to pin 26.
7. Solder bridge Pins 19 & 20 together
8. Solder bridge Pins 26 & 27 together.
9. Solder bridge the two leads of the chip transistor above pin 27.
10. Unsolder or cut the 47K Chip Resistor marked "472"
11. Reassemble the radio.




Caution

BEARCAT MR-8100

EXPANDED RF (800MHz)

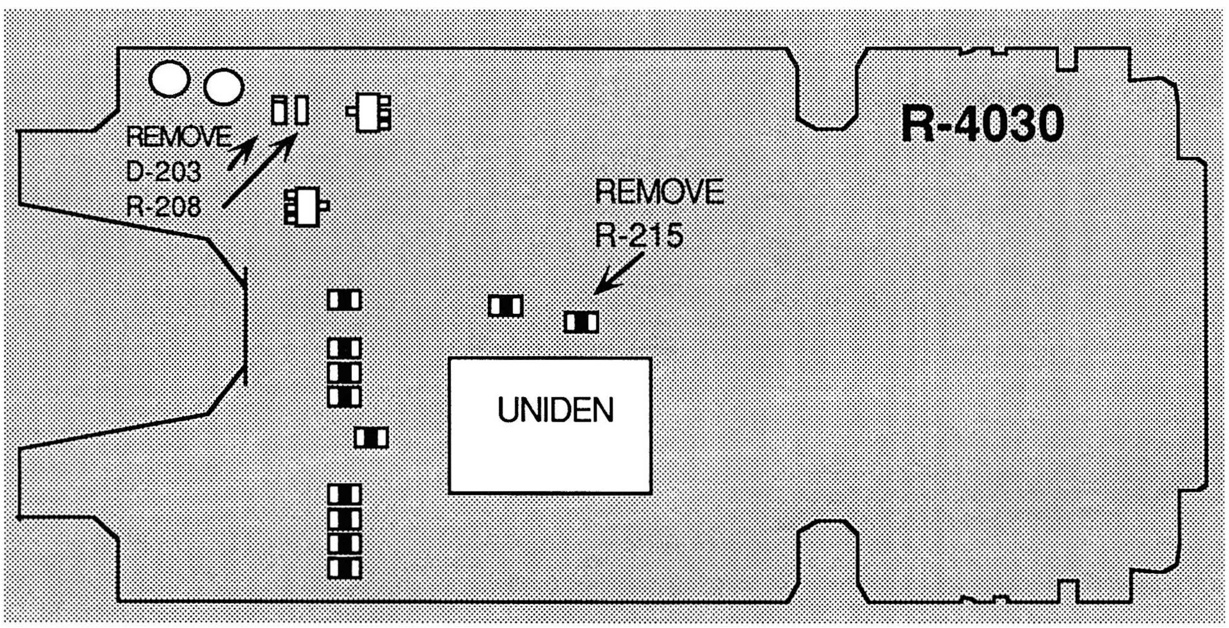
1 Connect radio to the programming computer.
2. Place [CAP LOCK]=OFF & [# LOCK]=OFF.
3. Press [CONTROL] [ALT] [P].
4. Press [CAP LOCK]=ON.
5. Type ECPA1986 [ENTER].
6. Enter expanded frequencies.

REGENCY R-4030

EXPANDED RF (800MHz)
Extended Battery Life

1. Remove Battery and Antenna.
2. Remove 2 screws from case and 2 from the battery retaining plate and open case.
3. Locate and remove two small screws at the base of the circuit board.
4. Gently pull the front panel from the circuits.
5. Locate and remove the 10 K resistor R-215 located above the microprocessor (Uniden UC-1147). Note the resistor is above the "den" letters on the microprocessor.
6. Locate and remove the Diode D-203 and Resistor R-208 located by the Speaker. (Battery Mod)
6. Replace the front panel. Keep the holes in the bottom of the case and board lined up and make sure the dual in-line connector is reconnected properly.
7. Reassemble scanner.

If the radio fails to power up, recharge the battery or, the dual in-line connector was not inserted correctly. f the display will not work, make sure that the rows of fine pin are aligned properly with the socket.

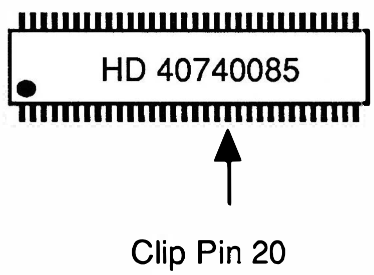




REGENCY R-1600
EARLY MODELS (NO BNC CONNECTOR)

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove 4 screws from the bottom case remove the bottom cover.
3. Locate the microprocessor and clip pin 20.
4. Reassemble scanner.





Caution

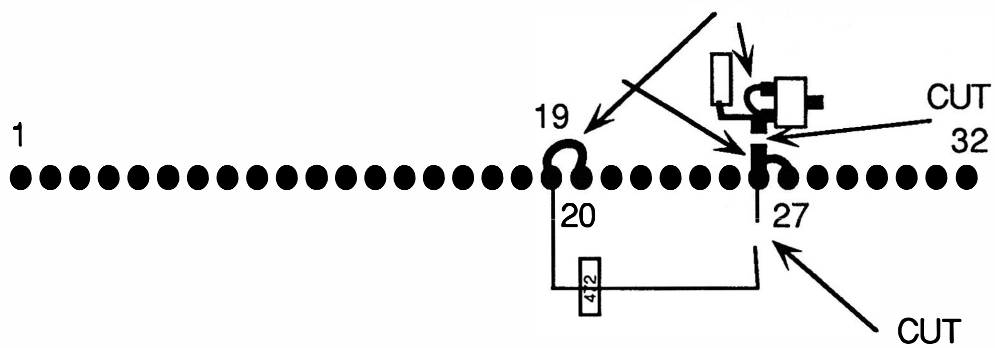
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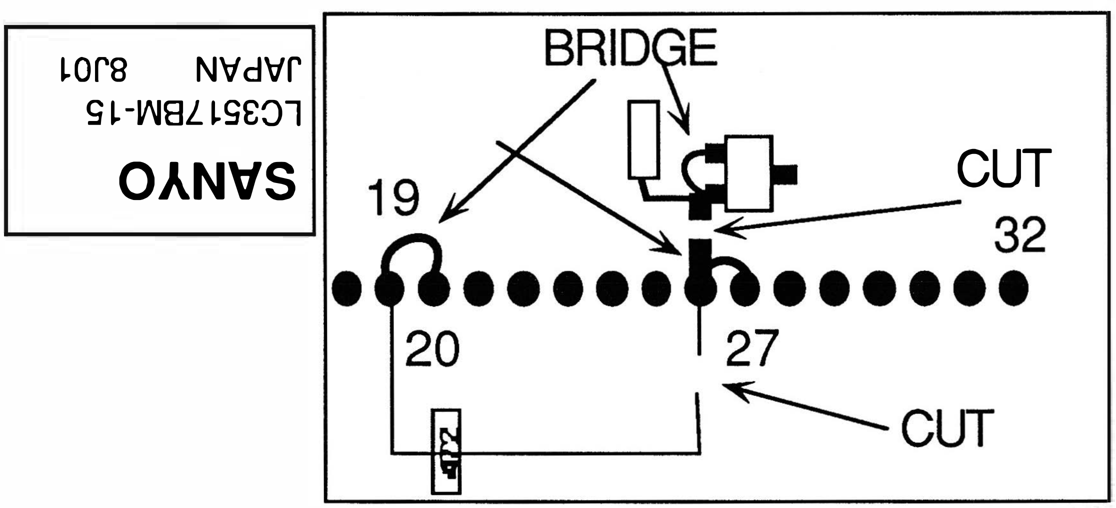
REGENCY R-1600

LATER MODELS (WITH BNC CONNECTOR)

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove 4 screws from the bottom case remove the bottom cover.
3. Locate the SANYO IC. (Identification printed upside down with the front of the radio facing you.
4. Locate the long row of solder pins above the Sanyo IC.
5. Locate Pin 26 of the Microprocessor.
6. Cut the two traces leading to pin 26.
7. Solder bridge Pins 19 & 20 together
8. Solder bridge Pins 26 & 27 together.
9. Solder bridge the two leads of the chip transistor above pin 27.
10. Unsolder or cut the 47K Chip Resistor marked "472"
11. Reassemble the radio.







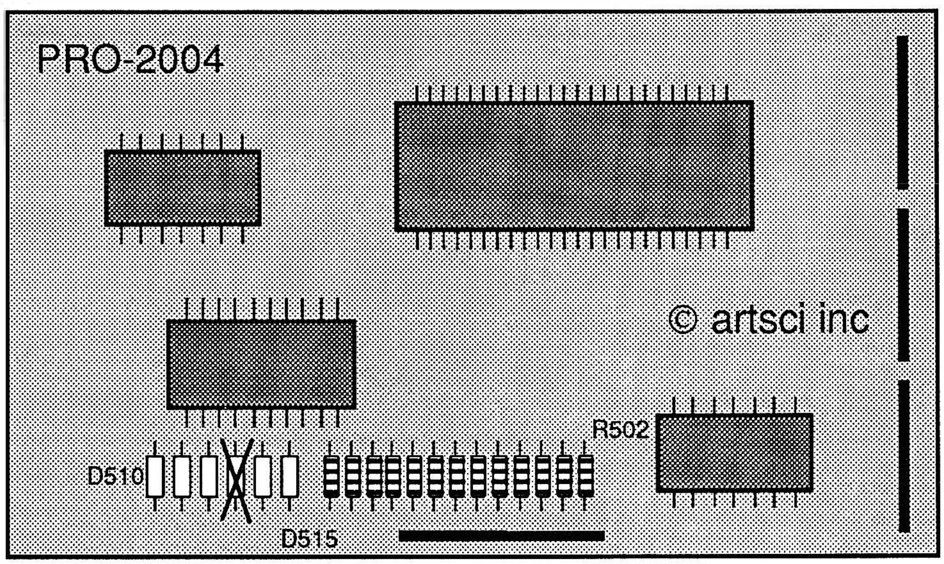
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RADIO SHACK PRO-2004

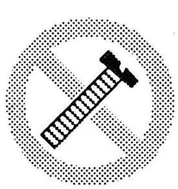
EXPANDED RF (800MHz)
100 additional Memory Channels

1. Remove Power and Antenna.
2. Remove 4 screws from the case and slide the case off.
3. Locate circuit board PC-3
4. Remove metal cover on top side of PC-3
5. Cut Diode D-513 (800 MHZ Mod)
6. Add a 1N914 or 1N4148 Diode in position D-510. (for 400 memories)
   Note: Radio Shack part # 276-1122.
   Note: Diode locations D-510 and D-511 are not labeled
7. Replace metal cover
8. Reassemble radio.



DIODE FUNCTIONS:

D-510 Add for 400 memories
D-512 Remove for 12.5KHz Stepping. (leave in for 30 KHz)
D-513 Remove for 800 Band Receive.
D-514 Add to increase scanning speed to 20 Channels per second



Caution

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RADIO SHACK PRO-2005

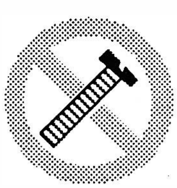
EXPANDED RF (800MHz)
SCAN SPEED INCREASE.

1. Remove Power and Antenna.
2. Remove screws from the case
3. Locate Diode D502. It is located behind the number 3 key on the keypad.
4. Cut the exposed lead of D502 and push the ends apart.
5. Install a Diode in the empty location D-501. (Speed Increase)
6. Reassemble the radio.

RADIO SHACK PRO-2006

EXPANDED RF (800MHz)
SCAN SPEED INCREASE.

1. Remove Power and Antenna.
2. Remove screws from the case
3. Locate Diode D502. It is located behind the number 3 key on the keypad.
4. Cut the exposed lead of Diode D502 and push the ends apart.
5. Cut Diode D-503. (15 Percent speed increase.)
5. Reassemble the radio.

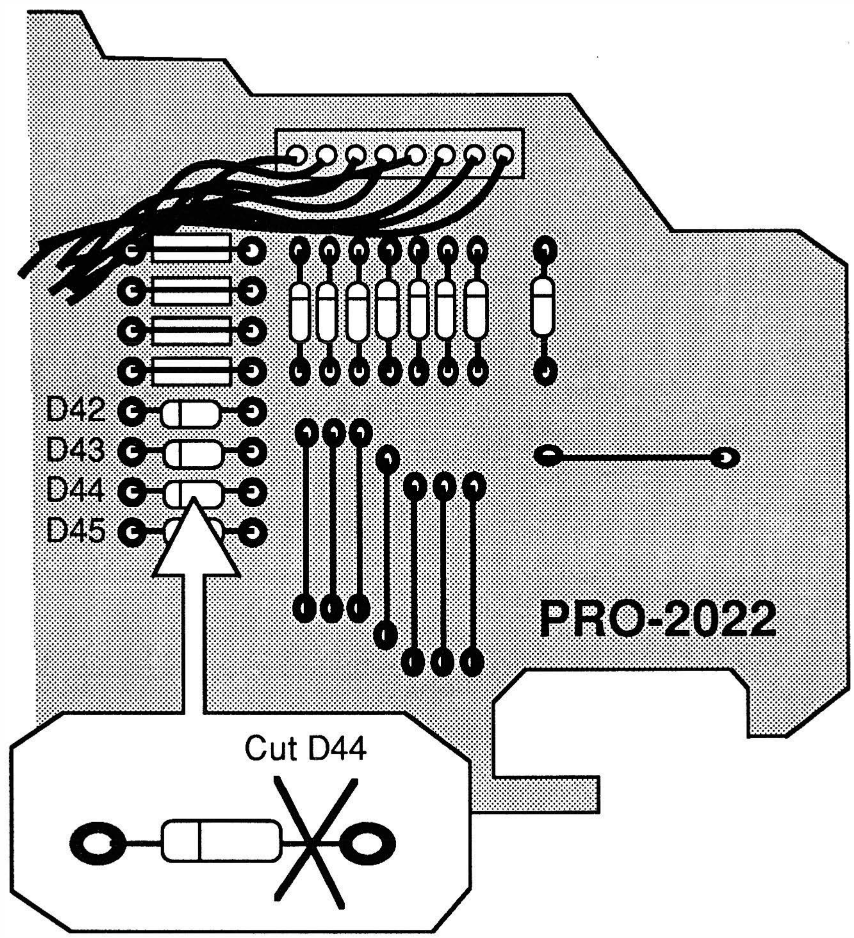


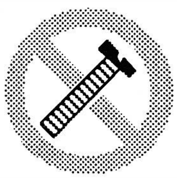
Caution

RADIO SHACK PRO-2022

EXPANDED RF (800MHz)

1. Remove Power and Antenna.
2. Remove screws from the case
3. Locate and cut Diode D44.
4. Reassemble the radio.





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RADIO SHACK PRO-33

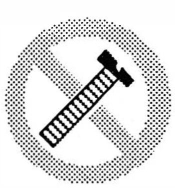
800 MHZ Expansion

1. Remove Power and Antenna.
2. Remove screws from the case
3. Locate LOGIC circuit board.
4. Locate and cut Diode D11
5. Reassemble the radio.

RADIO SHACK PRO-34

800 MHZ Expansion

1. Remove Power and Antenna.
2. Remove screws from the case
3. Locate LOGIC circuit board.
4. Locate and cut Diode D11
5. Reassemble the radio.



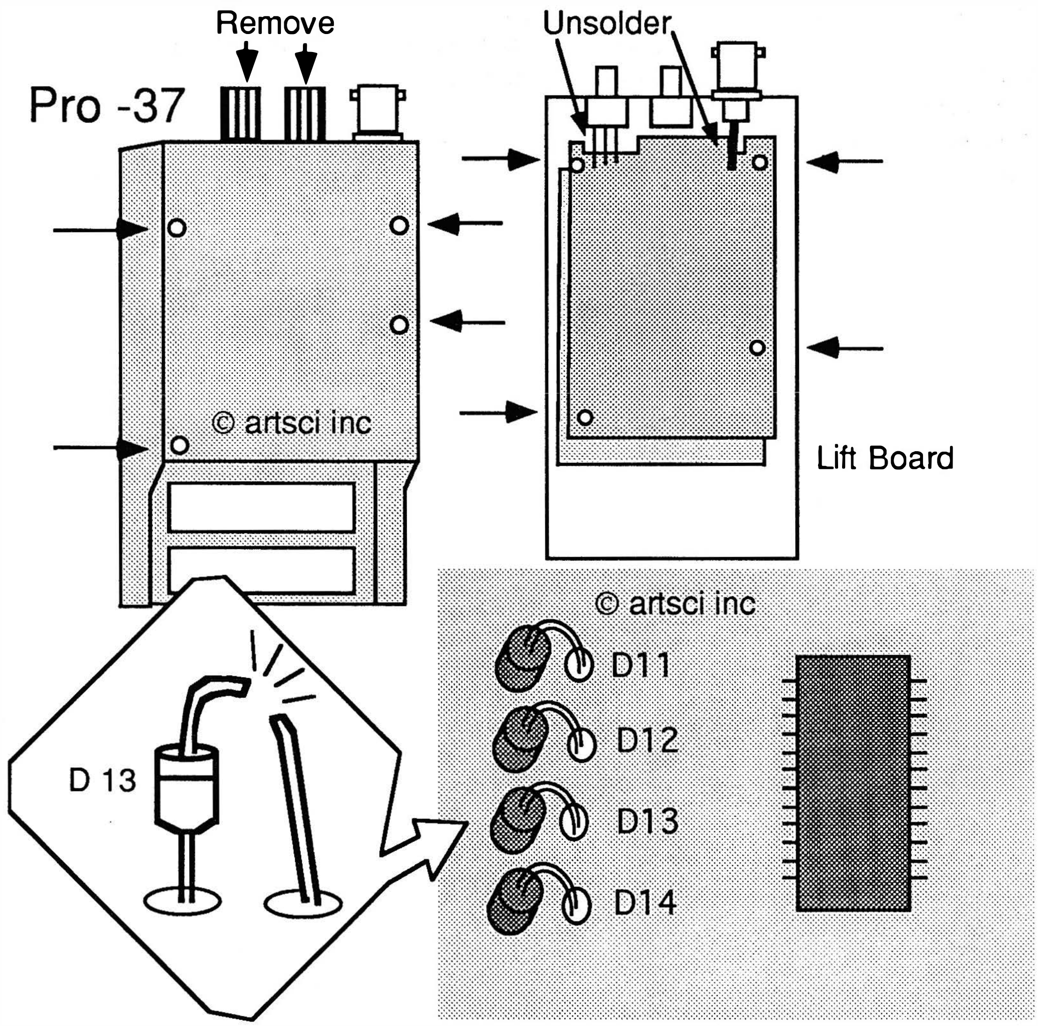
Caution

These modifications have not been tested. The Author, Publisher and all other parties takes NO responsibility or liability for any damage or violation resulting from these modifications. Performing any modification may be a Violation of FCC Rules and will void the warranty of the radio. Use of any modified radio may be a violation of FCC rules. If you have any doubts, DO NOT PERFORM THIS MODIFICATION.

RADIO SHACK PRO-37

800 MHZ Expansion

1. Remove batteries and Antenna.
2. Remove Knobs.
3. Remove the 4 body screws.
4. Slide Case off. (over Vol & Squelch posts)
5. Unsolder BNC Connector. You may wish to unsolder the 3 wires to the control pot.
6. Unscrew 4"Hex/Nuts Posts" holding upper board.
7. Unplug upper board.
8. Remove 3 shield screws and lift the shield.
9. Clip Diode D13.
10. Reassemble the radio.





Caution

These modifications have not been tested. The Author, Publisher and all other parties takes NO responsibility or liability for any damage or violation resulting from these modifications. Performing any modification may be a Violation of FCC Rules and will void the warranty of the radio. Use of any modified radio may be a violation of FCC rules. If you have any doubts, DO NOT PERFORM THIS MODIFICATION.

RADIO SHACK PRO-43

800 MHZ Expansion

1. Remove battery and Antenna.
2. Remove Knobs.
3. Remove the four screws from the back case & gently remove the case.
4. Unsolder the BNC connector from the top board.
5. Remove six screws from the top board.
6. Disconnect the two connectors near the shielded area.
7. Gently lift the top board and set it aside.
8. Remove the two screws securing the middle board.
9. Lift the board and set it aside. (Do not disconnect it from the bottom board.)
10. Unsolder the four corners of the shield and remove it.
11. Locate the surface diodes under the CPU.
12. Locate and remove D4. Do not crush the part. Unsolder and remove it.
13. Reassemble the radio.
14.


Caution

Radio / Tech Modifications

APPENDIX

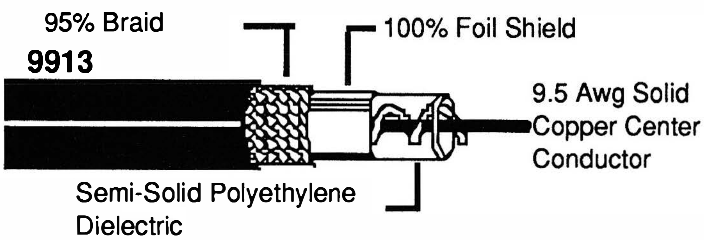
COAX TYPE	VEL %	dB ATTENUATION PER 100 FEET. 100 MHz	200 Mhz	400 MHz	1000 MHz	LENGTH IN FEET FOR 1 WAVELENGHT 146 MHz	222 MHz	445 MHz
9913 (100% shield)	89	1.4	1.8	2.6	4.5	6.00	3.94	1.97
RG-8U FOAM (8214)	80	1.8	2.7	4.2	7.0	5.39	3.55	1.77
RG-213(NON-CONTAM.)	66	2.2	3.2	4.7	8.5	4.45	2.93	1.46
RG-8X(MINI-FOAM)	78	3.7	5.4	8.0	13.5	5.26	3.46	1.72
9311 (100% SHIELD 58U)	78	4.5	6.3	9.0	14.5	5.26	3.46	1.72
RG-58U (SOLID CENTER)	66	4.5	6.7	10.0	17.0	4.45	2.93	1.46
RG-58A/U (STRANDED CTR)	66	4.9	7.5	11.5	21.5	4.45	2.93	1.46

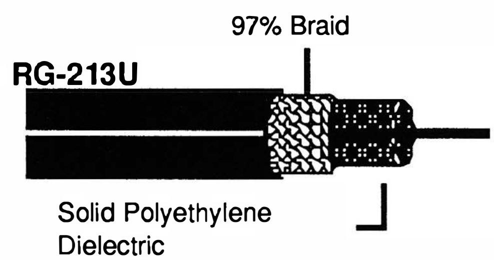
COAX LENGTHS SHOULD BE MULTIPLE HALF WAVELENGHTS.

$$\frac{984}{\text{FREQ. IN MHZ}} \times \text{VEL \%} = \text{ONE WAVE LENGHT IN FEET.}$$

db - % loss chart

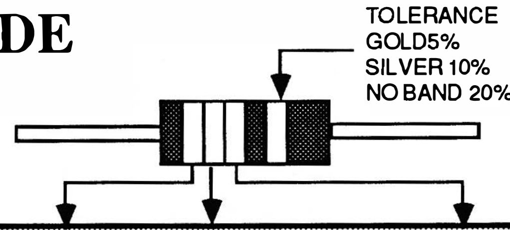
db Loss	Power Loss	db Loss	Power Loss	db Loss	Power Loss	db Loss	Power Loss
		2.0	37 %	4.0	60 %	6.0	75 %
0.2	4 %	2.2	39 %	4.2	62 %	7.0	80 %
0.4	8 %	2.4	42 %	4.4	63 %	8.0	84 %
0.6	13 %	2.6	45 %	4.6	65 %	9.0	87 %
0.8	17 %	2.8	47 %	4.8	67 %	10.0	90 %
1.0	21 %	3.0	50 %	5.0	68 %	20.0	99 %
1.2	24 %	3.2	52 %	5.2	70 %	30.0	100 %
1.4	27 %	3.4	54 %	5.4	71 %	40.0	100 %
1.6	30 %	3.6	56 %	5.6	73 %		
1.8	33 %	3.8	58 %	5.8	74 %		





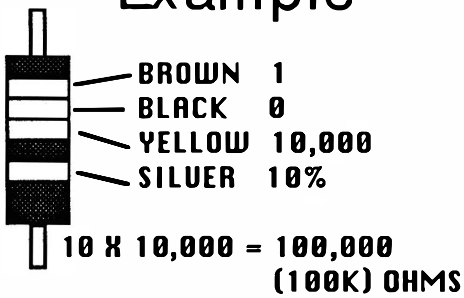
APPENDIX A

RESISTOR COLOR CODE

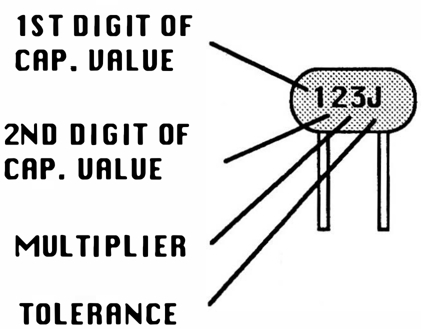


COLOR	1st DIGIT	2nd DIGIT	MULTIPLY BY
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000
GOLD			.1
SILVER			.01

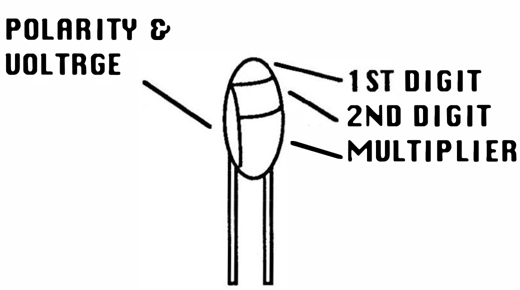
Example



CAPACITORS



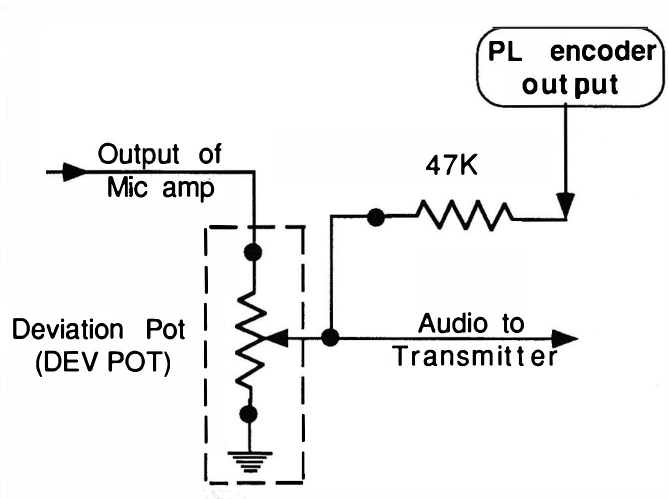
MULTIPLIER		TOLERANCE		
	MULTIPLY BY		10pF or less	over 10pF
0	1	B	0.1pF	
1	10	C	0.25pF	
2	100	D	0.5pF	
3	1,000	F	1.0pf	1%
4	10,000	G	2.0pf	2%
5	100,000	H		3%
		J		5%
8	.01	K		10%
9	0.1	M		20%



COLOR	DIGIT	MULTIPLIER	VOLTAGE
BLACK	0	NONE	4
BROWN	1	10	6
RED	2	100	10
ORANGE	3	1,000	15
YELLOW	4	10,000	20
GREEN	5	100,000	25
BLUE	6	1,000,000	35
VIOLET	7	10,000,000	50
GRAY	8		
WHITE	9		

PL ENCODER HOOK-UP

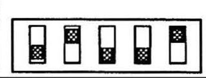
PL Encoder Connections



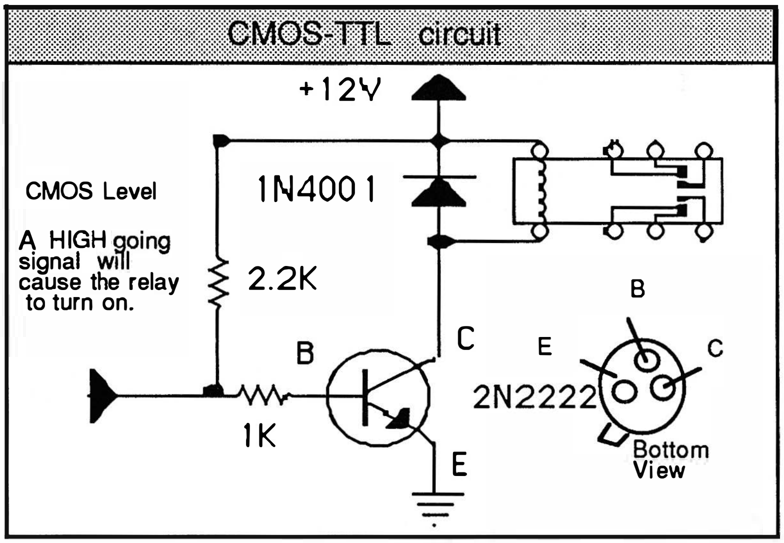
Attach a 47K ohm resistor to the output of the deviation pot. Attach the other end of resistor to the output of the PL encoder.

PL TONE CHART

PL TONE	FREQ. CODE	ICOM	YAESU	TS-32 SWITCH 1 2 3 4 5
67.0	-XZ	1	1	1 1 1 1 1
71.9	-XA	2	2	0 1 1 1 1
74.4	-WA	3	36	1 0 1 1 1
77.0	-XB	4	3	0 0 1 1 1
79.7	-SP	5	38	1 1 0 1 1
82.5	-YZ	6	4	0 1 0 1 1
85.4	-YA	7	40	1 0 0 1 1
88.5	-YB	8	5	0 0 0 1 1
91.5	-ZZ	9	42	1 1 1 0 1
94.8	-ZA	10	6	0 1 1 0 1
97.4	-ZB	11		1 0 1 0 1
100.0	-1Z	12	7	0 0 1 0 1
103.5	-1A	13	8	1 1 0 0 1
107.2	-1B	14	9	0 1 0 0 1
110.9	-2Z	15	10	1 0 0 0 1
114.8	-2A	16	11	0 0 0 0 1
118.8	-2B	17	12	1 1 1 1 0
123.0	-3Z	18	13	0 1 1 1 0
127.3	-3A	19	14	1 0 1 1 0
131.8	-3B	20	15	0 0 1 1 0
136.5	-4Z	21	16	1 1 0 1 0
141.3	-4A	22	17	0 1 0 1 0
146.3	-4B	23	18	1 0 0 1 0
151.4	-5Z	24	19	0 0 0 1 0
156.7	-5A	25	20	1 1 1 0 0
162.2	-5B	26	21	0 1 1 0 0
167.9	-6Z	27	22	1 0 1 0 0
173.8	-6A	28	23	0 0 1 0 0
179.9	-6B	29	24	1 1 0 0 0
186.2	-7Z	30	25	0 1 0 0 0
192.8	-7A	31	26	1 0 0 0 0
203.5	-M1	32	27	0 0 0 0 0
210.7		33		



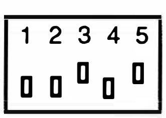
1 = on / 2 = off
example above
01001=107.2



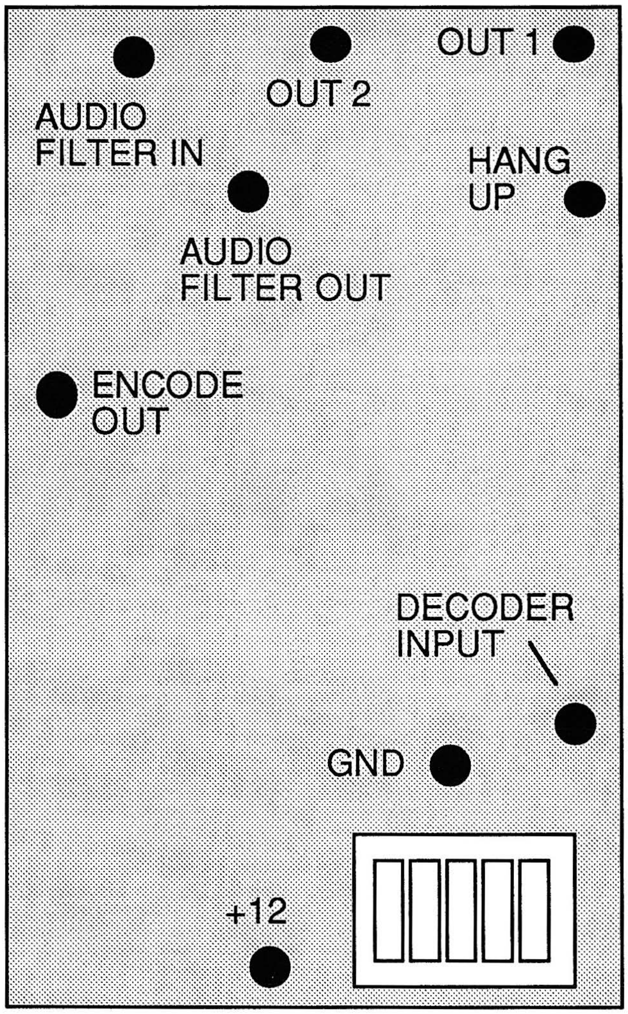
Freq.	1 2 3 4 5	Code	#
67.0	1 1 1 1 1	XZ	1
71.9	0 1 1 1 1	XA	2
74.4	1 0 1 1 1	WA	3
77.0	0 0 1 1 1	XB	4
79.7	1 1 0 1 1	SP	5
82.5	0 1 0 1 1	YZ	6
85.4	1 0 0 1 1	YA	7
88.5	0 0 0 1 1	YB	8
91.5	1 1 1 0 1	ZZ	9
94.8	0 1 1 0 1	ZA	10
97.4	1 0 1 0 1	ZB	11
100.0	0 0 1 0 1	1Z	12
103.5	1 1 0 0 1	1A	13
107.2	0 1 0 0 1	1B	14
110.9	1 0 0 0 1	2Z	15
114.8	0 0 0 0 1	2A	16
118.8	1 1 1 1 0	2B	17
123.0	0 1 1 1 0	3Z	18
127.3	1 0 1 1 0	3A	19
131.8	0 0 1 1 0	3B	20
136.5	1 1 0 1 0	4Z	21
141.3	0 1 0 1 0	4A	22
146.2	1 0 0 1 0	4B	23
151.4	0 0 0 1 0	5Z	24
156.7	1 1 1 0 0	5A	25
162.2	0 1 1 0 0	5B	26
167.9	1 0 1 0 0	6Z	27
173.8	0 0 1 0 0	6A	28
179.9	1 1 0 0 0	6B	29
186.2	0 1 0 0 0	7Z	30
192.8	1 0 0 0 0	7A	31
203.5	0 0 0 0 0	M1	32

1 (ON) CLOSED
0 (OFF) OPEN

ON
OFF



=PL 100
00101

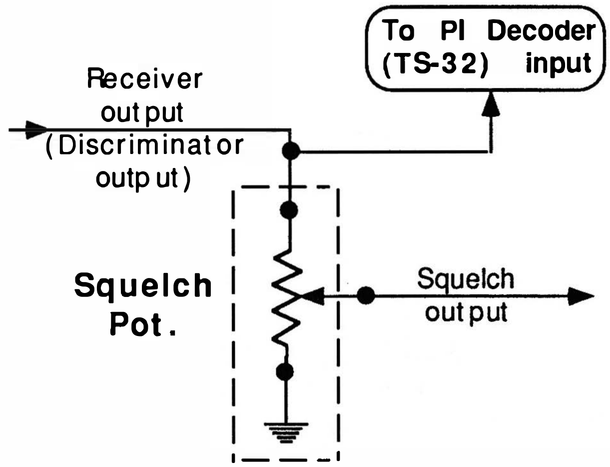


TS-32 LAYOUT

APPENDIX D

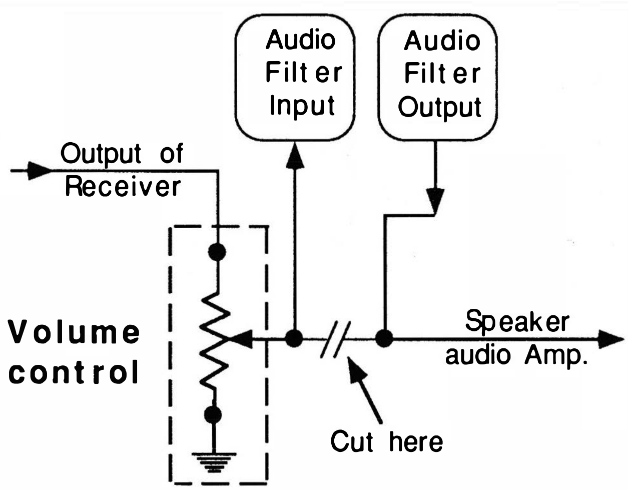
PL DECODER HOOK-UP

PL Decoder Connections



Attach a wire to the discriminator output. Attach the other end to the decoder input. The discriminator output is often connected to the squelch pot. See audio connections below for audio control.

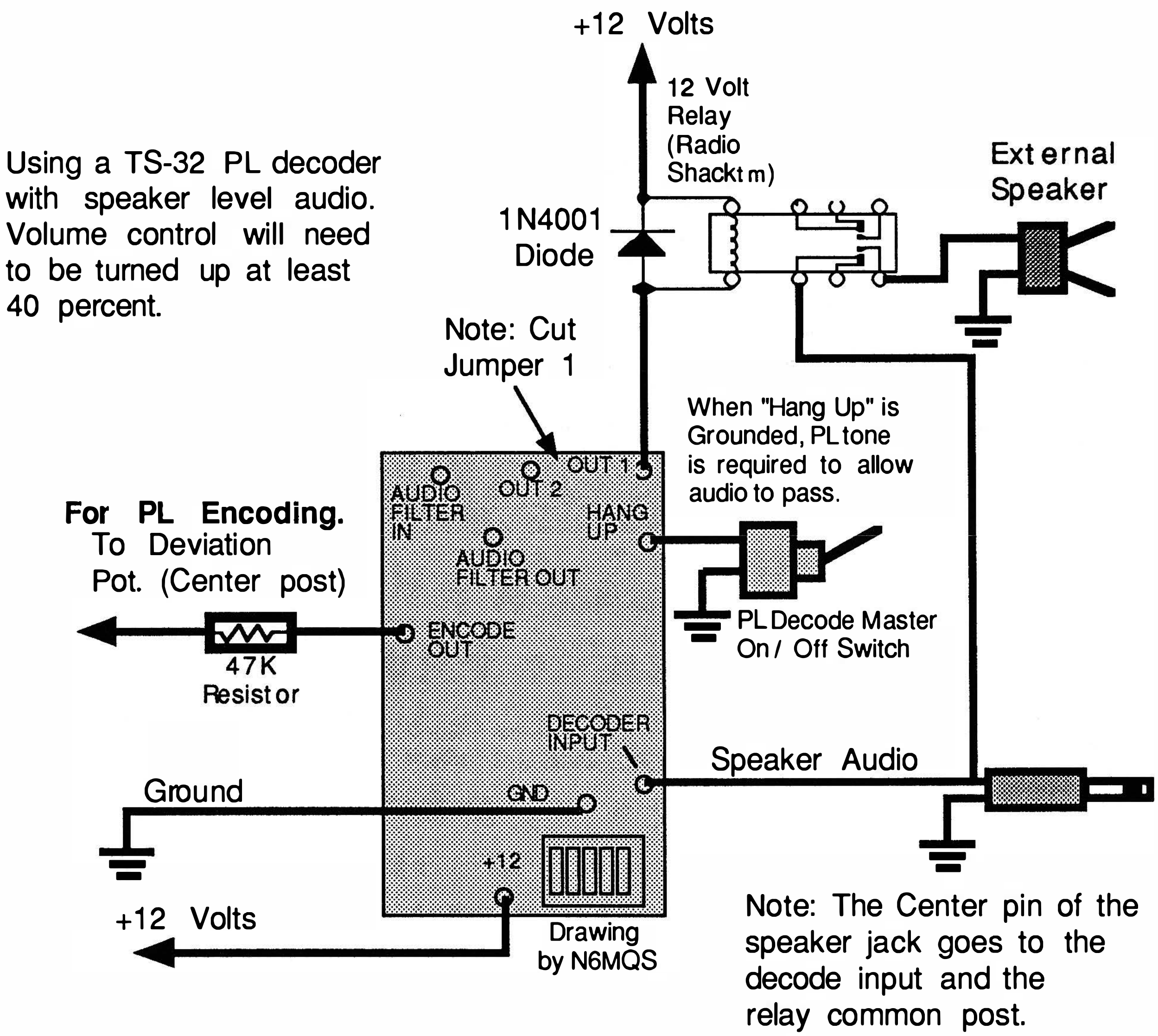
PL Decoder/ Audio Connections



Audio muting is controlled by the TS-32 Board. When a PL is present on the signal, audio will pass.

TS-32 HOOKUP

PL Decoder



APPENDIX E

##	FREQ.	DESCRIPTION	##	FREQ.	DESCRIPTION
1			51		
2			52		
3			53		
4			54		
5			55		
6			56		
7			57		
8			58		
9			59		
10			60		
11			61		
12			62		
13			63		
14			64		
15			65		
16			66		
17			67		
18			68		
19			69		
20			70		
21			71		
22			72		
23			73		
24			74		
25			75		
26			76		
27			77		
28			78		
29			79		
30			80		
31			81		
32			82		
33			83		
34			84		
35			85		
36			86		
37			87		
38			88		
39			89		
40			90		
41			91		
42			92		
43			93		
44			94		
45			95		
46			96		
47			97		
48			98		
49			99		
50			100		

Performance Report

Radio ______________________________ Date ____________

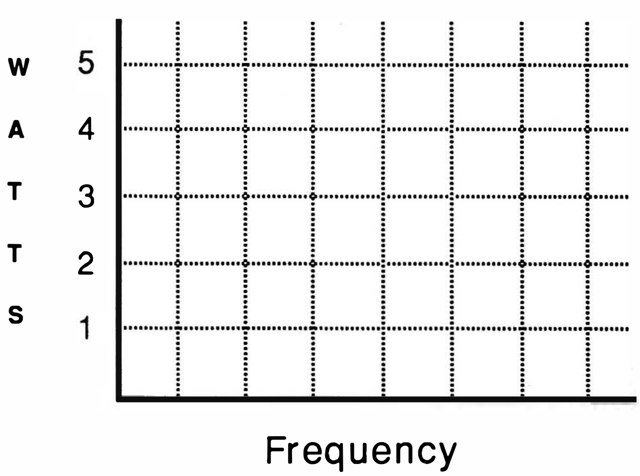
Owner : Name ____

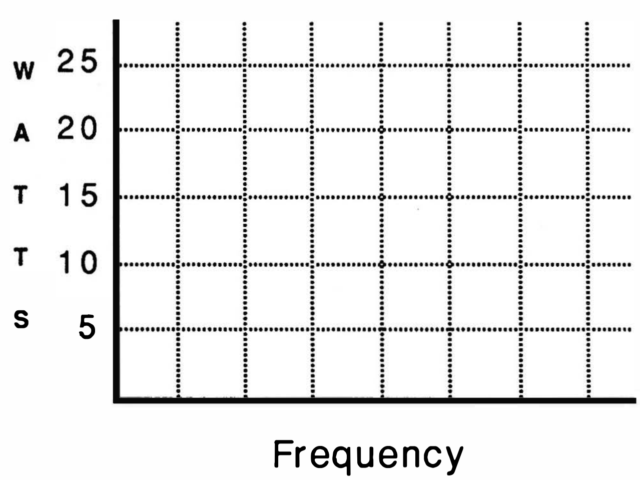
Address ____

City ____________________ St. ______ Zip ____________

Phone (   )   -

Description	Before	After
Power out (Low)	________ Watts	________ Watts
Power out (High)	________ Watts	________ Watts
Frequency Error (Simplex)	________ Hz	________ Hz
Frequency Error (Offset)	________ Hz	________ Hz
Receive Sensitivity (Mid-band)	________ uv	________ uv
Receive Sensitivity (_____MHz)	________ uv	________ uv
Receive Sensitivity (_____MHz)	________ uv	________ uv
PL Deviation	________ Hz	________ Hz
DTMF Deviation	________ KHz	________ KHz
Audio Deviation	________ KHz	________ KHz
Lowest usable Freq @ .5 Pwr	________ MHz	________ MHz
Highest usable Freq @ .5 Pwr	________ MHz	________ MHz



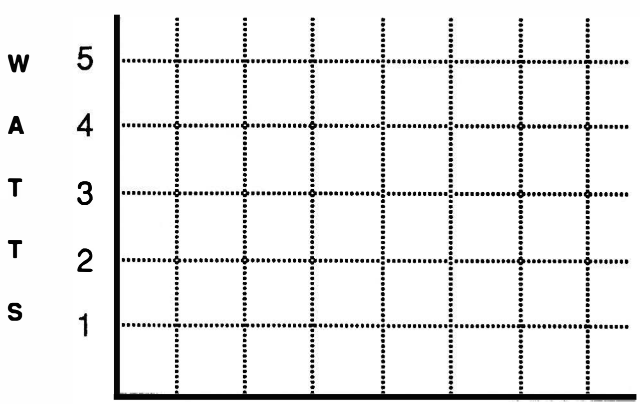


Performance Report

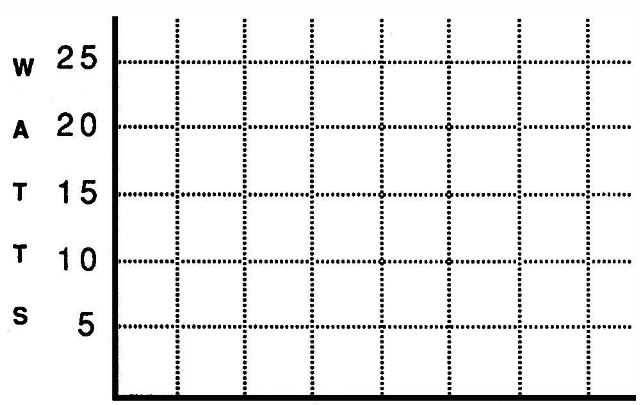
Radio ______________________________ Date ____________

Owner : Name ____
Address ______________________________________
City ____________________ St. ______ Zip ____________
Phone (   )   -

Description	Before	After
Power out (Low)	________ Watts	________ Watts
Power out (High)	________ Watts	________ Watts
Frequency Error (Simplex)	________ Hz	________ Hz
Frequency Error (Offset)	________ Hz	________ Hz
Receive Sensitivity (Mid-band)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
PL Deviation	________ Hz	________ Hz
DTMF Deviation	________ KHz	________ KHz
Audio Deviation	________ KHz	________ KHz
Lowest usable Freq @ .5 Pwr	________ MHz	________ MHz
Highest usable Freq @ .5 Pwr	________ MHz	________ MHz



Frequency



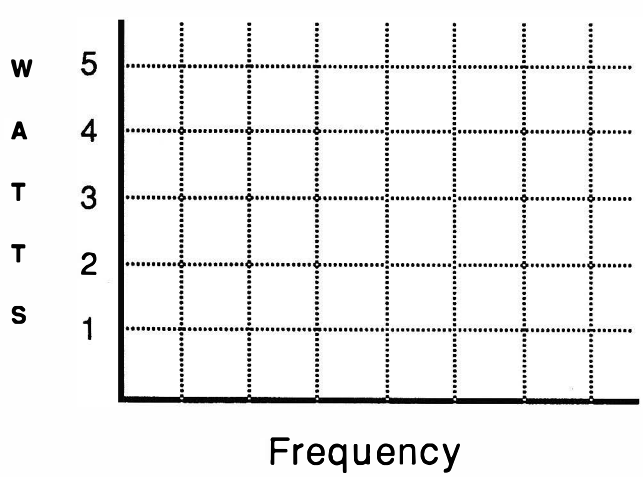
Frequency

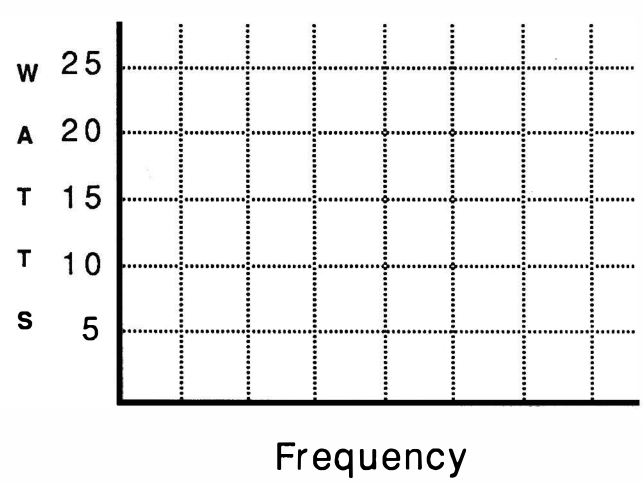
Performance Report

Radio ______________________________ Date ____________

Owner : Name ____
Address ______________________________________
City ____________________ St. Zip ______________
Phone ( ) - ____

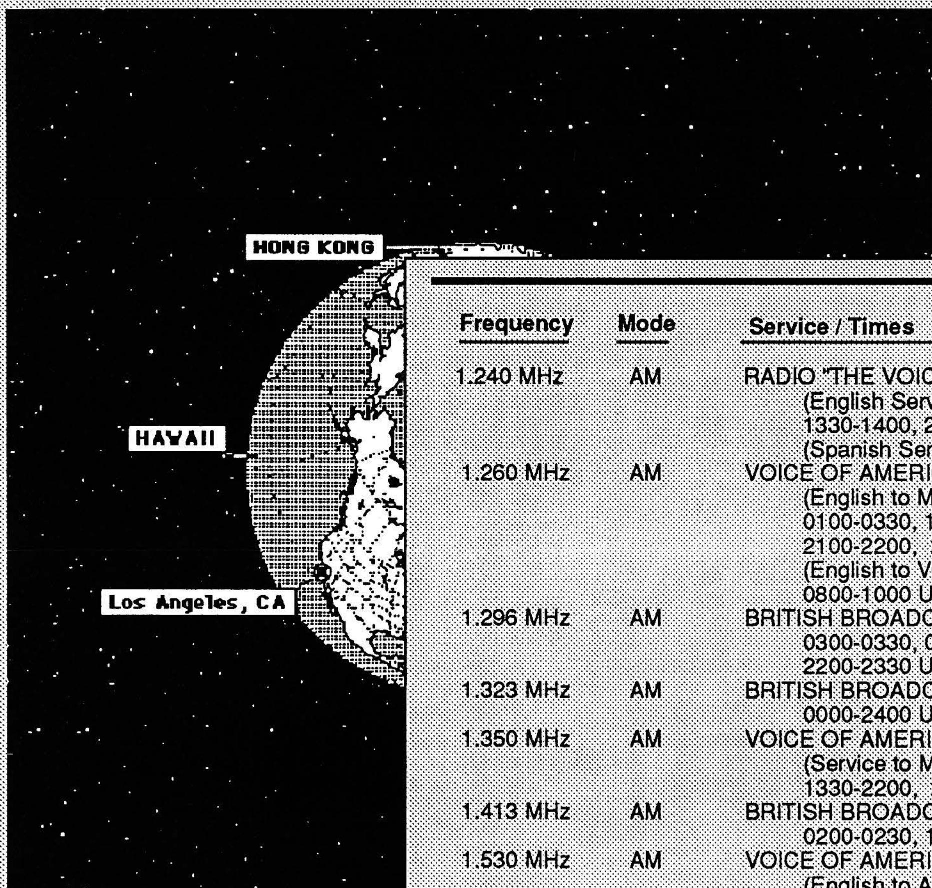
Description	Before	After
Power out (Low)	________ Watts	________ Watts
Power out (High)	________ Watts	________ Watts
Frequency Error (Simplex)	________ Hz	________ Hz
Frequency Error (Offset)	________ Hz	________ Hz
Receive Sensitivity (Mid-band)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
Receive Sensitivity (____MHz)	________ uv	________ uv
PL Deviation	________ Hz	________ Hz
DTMF Deviation	________ KHz	________ KHz
Audio Deviation	________ KHz	________ KHz
Lowest usable Freq @ .5 Pwr	________ MHz	________ MHz
Highest usable Freq @ .5 Pwr	________ MHz	________ MHz





Volume # 1 $ 19.95

North American Shortwave Frequency Guide



New Publication

English & Spanish Broadcasts

Frequency	Mode	Service / Times
1.240 MHz	AM	RADIO "THE VOICE OF VIETNAM", (English Service), 1000-1030, 1230-1300, 1330-1400, 2330-2400 UTC, (Spanish Service), 1100-1130 UTC
1.260 MHz	AM	VOICE OF AMERICA (English to Middle East/Europe service) 0100-0330, 1330-1400, 1400-1600, 2100-2200, 2230-2400 UTC (English to VOA Europe) 0300-0330, 0800-1000 UTC
1.296 MHz	AM	BRITISH BROADCASTING CORP., 0300-0330, 0430-0500, 0600-0630, 2200-2330 UTC
1.323 MHz	AM	BRITISH BROADCASTING CORP., 0000-2400 UTC
1.350 MHz	AM	VOICE OF AMERICA, (Service to Middle East) 0000-0500, 1330-2200, 2230-2300 UTC
1.413 MHz	AM	BRITISH BROADCASTING CORP., 0200-0230, 1300-1400, 1730-1830
1.530 MHz	AM	VOICE OF AMERICA (English to American Republics service) 0030-0100 UTC
1.575 MHz	AM	VOICE OF AMERICA (English to Pacific service) 2230-2400, 0030-0100 UTC. (English to VOA Europe) 1530-1600 UTC
	AM	ARMED FORCES RADIO, JAPAN, U.S. AIR FORCE, 0005-2205 UTC
1.580 MHz	AM	VOICE OF AMERICA (English to Caribbean) 0000-0200, 1000-1200 UTC (English to American Republics) 0030-0200 UTC
1.610 MHz		TRAVELERS INFORMATION SERVICE ACROSS U.S.
1.800 MHz	CW	**START OF AMATEUR RADIO 160 METER BAND (Ends 2.000 MHz)**
1.890 MHz	LSB	W1AW ARRL VOICE BULLETINS
2.500 MHz	VOICE	WWV INTERNATIONAL STANDARDS TIME FREQUENCY

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Complete Shortwave Listings.

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CARD #

EXP DATE

Modifications for:

Kenwood

Model		Model	
TH-21A	∞•	TM-731	∞
TH-25A	∞•	TM-732	∞•
TH-26A	∞•	TM-741	∞
TH-27A	∞•	TM-941	∞
TM-28A	∞•	TM-2530	∞•
TH-31A/BT	•	TM-2550	∞•
TH-41A/BT	•	TM-2570	∞•
TH-45A	•	TR-751	∞•
TH-48A	∞•	TR-2500	∞
TH-55A	•	TR-2600	∞
TH-75A	∞	TS-140S	∞
TH-77A	∞	TS-430S	∞
TH-78A	∞•	TS-440S	∞
TH-215	∞•	TS-450S	∞
TH-315	∞•	TS-680	∞
TM-221	∞•	TS-690S	∞
TM-231A	∞•	TS-711	∞
TM-241A	∞•	TS-790A	∞
TM-321	•	TS-850S	∞
TM-421	∞•	TS-930S	∞
TM-431A	∞•	TS-940	∞
TM-441A	∞•	TS-950SD	∞
TM-621	∞•	TS-2400	∞
TM-631	∞•	TW-4100	
TM-701A	∞•	TM SERIES	
TM-721	∞•		

∞ Frequency Expansion
• Alignment controls

ICOM

Model		Model	
IC-02AT	∞	IC-745	∞
IC-2A/AT	•	IC-751	∞
IC-2GAT	∞•	IC-761	∞
IC-2SA	∞•	IC-765	∞
IC-2SAT	∞•	IC-781	∞
IC-3SAT	∞•	IC-900	∞•
IC-2SRA	∞•	IC-901A	∞
IC-04AT	∞	IC-970	∞
IC-4GAT	∞•	IC-1200	∞
IC-4SAT	∞•	IC-2400	∞•
IC-12AT	∞	IC-2410	∞•
IC-12GAT	•	IC-2500E	∞•
IC-24	∞•	IC-3200	∞•
IC-25	∞•	IC-3210	∞•
IC-27A/H	•	IC-3220	∞•
IC-28A/H	∞	IC-H16	
IC-32AT	∞	IC-M800	∞
IC-38	•	IC-P2AT	∞•
IC-48	∞	IC-P4AT	∞•
IC-228	∞•	IC-R71	∞
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